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In this issue:

Supporting Ground Forces 484

The French Aircraft Industry 488

Pilot's Pay - - - - 493

Corporations' Accounts 494

Airwork Comes of Age - 503

Freeing Independent Commerce

NOT since the war ended have the British charter operators experienced such difficult times. A primary cause is to be found in international restrictions on the import and export of goods and currency, but there are other circumstances and restrictions which the Government have power to alter. The Civil Aviation Act of 1946 is, of course, a stumbling-block to free development of independent merchant air transport in the United Kingdom. The Act was designed to protect the Corporations but not necessarily to place such crippling restrictions upon these modern merchant adventurers as to reduce their industrial usefulness to nil.

During the present slack period B.O.A.C. and B.E.A., through their expanding charter divisions, are apparently able to handle the bulk of official Government business. B.O.A.C.'s Cargo Booking Unit has also reported a considerable increase in air cargo exports since the devaluation of the pound, and larger quantities of British export goods have been carried by the Corporation to the United States, the Middle East and South Africa. Now that the Argonauts are going back into service, more Yorks and Lancastrians will become available for freight carrying.

Even if B.O.A.C. does create, as rumour has it, a special line with special aircraft for charter operations, and B.E.A. carries an increasing quantity of passengers and freight to the Continent through its existing charter organization, there should still be room for independent air taxi operators carrying the surplus which the Corporations are unable to handle. The British charter companies have demonstrated their usefulness and flexibility on more than one special operation during the past two years; examples are the evacuations in India and Pakistan and, the Berlin Air Lift.

Section 23 of the Civil Aviation Act could now profitably be adjusted, if only for a trial period, to encourage the expansion of air commerce with the aid of the charter operators. We believe that there should be a relaxation of regulations to permit operators to accept separate freight consignments and to make up their own loads without requiring a third party to charter the aircraft. It is also suggested that an expansion of scheduled-service agreements should be permitted and encouragement given to operate tributary routes abroad. There is a serious risk under existing conditions that the keenly competitive foreign operators will secure the bulk of the trade carried on the world's non-scheduled air routes, leaving an inflexible and frustrated British air transport system to scramble for the crumbs.

Improvization and Specialization

EFFICIENCY with economy has been the guiding principle of R.A.F. re-equipment in the post-war years, and in pursuance of this principle the Service has profited immeasurably from the unparalleled versatility and adaptability of British aircraft. Outstanding among these are the Meteor and Vampire, which, after some five years of service, continue to broaden their fields of usefulness. With such excellent types well established in service, and with the classic example of the Mosquito as an inspiration, it follows that the Air Staff will seek to continue exploitation of the inherent flexibility of standard types; already there are indications that the mantle of the "Mossie" has fallen upon the English Electric Canberra.

The foregoing considerations must never obscure the need, or possible need, for strictly specialized types, among which the local-defence interceptor, and super-high-altitude and very long-range reconnaissance aircraft, appear especially important. The requirement for long-range bombers of the highest performance has so frequently been stressed in these columns as to need no reiteration. But air warfare can never be waged solely with "combat" aircraft (to use a convenient Americanism), and the R.A.F. must ensure that the most suitable types in the transport, training and other categories are available when required. Should the need be apparent for an assault transport, a pure-jet basic trainer, or a jet-propelled target aircraft, the development of such vital machines for special purposes must not be prejudiced by undue preoccupation with more spectacular equipment.

SUPPORTING GROUND FORCES

Weapons in Action on Westdown Ranges : "Paratechnicons" Displayed at Netheravon

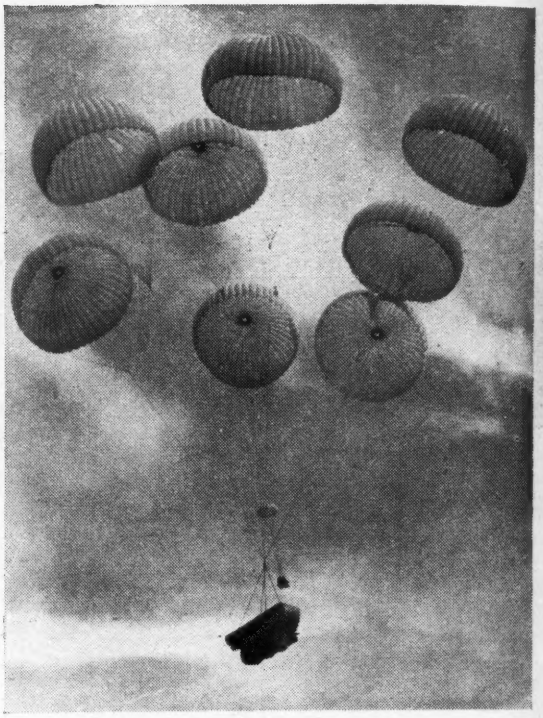
THOUGH the pattern of the air weapons demonstration for the Senior Officers' Course at the School of Land/Air Warfare, staged on Westdown Ranges, Wilts, last Tuesday week, faithfully followed that of earlier displays (even to the extent of being subjected to last-minute frustrations), real progress in technique and equipment was discernible.

A distant battery of 25-pounders manned by the Royal Horse Artillery opened the proceedings very prettily (the word is appropriate both to the standard of shooting and to the pyrotechnics delivered) by putting down smoke and flare shells to show how targets can be indicated by day or night. Red smoke shells are normally used; yellow signifies "own troops" and blue and green are available for special requirements. Though the red and green flare shells are visible on a clear night from 6,000ft at 30 miles distance, they were not easily seen in the bright sunlight which favoured the demonstration.

A line of M.T. was the objective for the first air assault, by four Meteor 4s of No. 11 Group, which, closing to short range, made good practice with their 20 mm Hispanos. The Meteors attacked individually and the last two vacated the target area in a very spectacular manner by banking over the vertical at low level and scampering away across the rolling, devastated plain.

"Flight" photograph

The R T control vehicle on the Westdown Ranges, with the roof-borne commentator in action.



Tne descent of a "paratechnicon" from a Halifax, flying at 1,200ft.

Three U.S.A.F. Lockheed F-80s now successively turned their six "50-calibre" Brownings loose on a sorry-looking Dakota; the din when one pilot opened fire nearer than usual to the spectatorial enclosure was quite unnerving, which can well be understood for the combined rate of fire is 7,200 rounds a minute. The retractable chute for ejecting the "empties" were clearly seen as the Shooting Stars made their devastatingly accurate attacks.

Equally good results were achieved by four de Havilland Sea Hornet 21s of No. 809 Squadron; this was the first occasion on which these new night fighter/strike leader two-seaters had demonstrated at Westdown, and they greatly reduced the scrap value of the already well-ventilated M.T. vehicles.

Without warning, a pair of silver Vampire 5s from a B.A.F.O. squadron now dropped steeply from the blue in a bombing dive. Each released a pair of 250 lb bombs and went its way in relative silence. Eleven seconds ticked by before the chalky earth where the bombs had struck home erupted in dirty fountains. The precise, cold-blooded deadliness of this attack was something we had never before witnessed.

From the Central Gunnery School came three Spitfire 16s, each with four 60 lb R.P.s, which they delivered in salvo with excellent effect against a group of derelict tanks. That in an attack of this kind the later machines must find difficulty in discerning their target through the smoke and dust could readily be appreciated. Using the gyro gun-sight, R.A.F. fighter bombers are now achieving an average error of 10 yards in their R.P. attacks but, as is well known, a direct hit must be achieved if a heavy tank is to be put out of action with certainty.

The U.S.A.F. contributed four F-47 Thunderbolts to the R.P. demonstration, and in two attacks these ageing Republics placed their projectiles (the propellant of which burns more spectacularly than the British variety) so accurately that one, if not two, tank turrets were dislodged. On their final run the Thunderbolts were successively slow-rolled, a manœuvre seemingly symbolic of the imminent departure of this type from the military arena.

Bomber Command then showed how its heavy equipment

Airborne troops, debarked from a Handley Page Hastings, take up position at the double.

can support troops in the field, six Lincolns putting down a total of six 500 and forty-eight 25 lb bombs on a target indicated by Mosquitoes. The instructions of the Mosquito-mounted master-bomber to the two pathfinders and to the approaching main force, and his subsequent assessment of the bombing, was a model of clarity. So accurate was the placing of the green target indicator that the Lincolns, in line-astern at 1,500-yard intervals, were ordered to make it their primary aiming point and to bomb direct (i.e., without vector or overshoot).

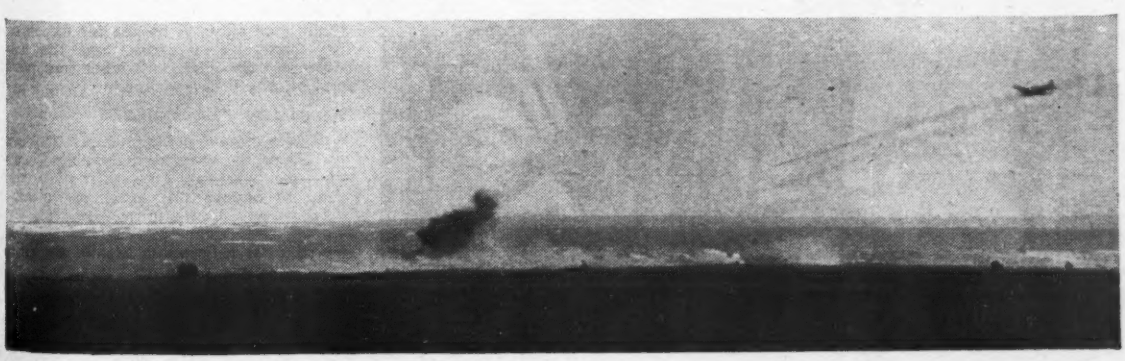
The "stream bombing" by the Lincolns preceded a demonstration by U.S.A.F. B-50s of the 43rd Bomb Group which, bombing "on the lead ship," put down a thin carpet of startlingly inaudible 100-pounders. These Strato-bombers are not really at home under 20,000ft, due to restrictions imposed by their bomb-sights; nevertheless, they appeared to achieve good results. General Johnson was anxious that it should be made clear that the technique demonstrated is not the only one practised by U.S.A.F. heavy-bomber units; it is, in fact, one of many, but is favoured for attacking military concentrations and the like because of the cumulative blast effect achieved. The U.S.A.F. commentator gave the following figures for the B-50: range, nearly 5,000 miles; maximum bomb load, 20,000 lb (the type can carry an atom bomb without modification); armament, 12 × 0.5in guns; speed, 350 m.p.h. at 25,000ft. Incidentally, in a helpful discourse on U.S. bombers, he stated that the four-jet North American B-45, standard U.S.A.F. light bomber, carries 16,000 lb of bombs for 850 miles, and that a range of 1,200 miles is foreseen.

As usual, four Mosquitoes bombed under the direction of a mobile radar-control post, but on this occasion did not manage to achieve their usually good results. The mean error seemed to be 300-400 yards, whereas 250 yards is nearer the usual figure. It should be put on record, however, that in a rehearsal on the previous day the "Mosquitoes" had registered a direct hit. The present radar employed for direction is of American origin and has a range of only 25-35 miles. A new American set, not yet available to the R.A.F., has an appreciably longer range.

To "demonstrate range of speeds and manœuvrability of jet aircraft" a Meteor and a Vampire came over from Thorney Island and Odiham respectively. The Meteor wrote its signature in tip trails, precipitated by an astonishingly sharp pull-up, followed by a flawless eight-point roll. With recollections of *Bulldog*, we guessed the pilot to be a noted Harvard-killer and head-on attacker of our acquaintance. The Vampire flew very fast and very slow at very close quarters, but was aerobatically handicapped by cloud; a Shooting Star which had been lurking in the background for some time failed, for some reason, to get in its display, though we had no doubt that this would have repaid watching.

On the following day there was a transport support demonstration at Netheravon—the usual sequel to the Westdown event. Here the major item of interest was the dropping of heavy containers, each having eight 42ft parachutes, from Halifaxes of No. 38 Group. These particular "paratechnicons" are capable of carrying a 6,000 lb load, but a larger type is being developed for the Hastings. During descent hinged flaps expose three pneumatic shock absorbers which deflate at an appropriate rate when the container touches down. The eight parachutes are released automatically. A jeep and a 6-pounder gun formed the demonstration load, but the "paratechnicon" is also being developed for personnel dropping.

Handley Page Hastings transports unloaded heavy cargoes, dropped supplies from 500ft and disembarked troops, and Dakotas and a Valetta illustrated their usefulness as instruments of army support by dropping parachutists and containers respectively. A Sikorsky Hoverfly helicopter performed its usual mercy mission.



An F-47 Thunderbolt of the U.S.A.F. delivers a well-aimed brace of R.P.s against the long-suffering Westdown tanks.

HERE and THERE

"Plainfare" Protracted

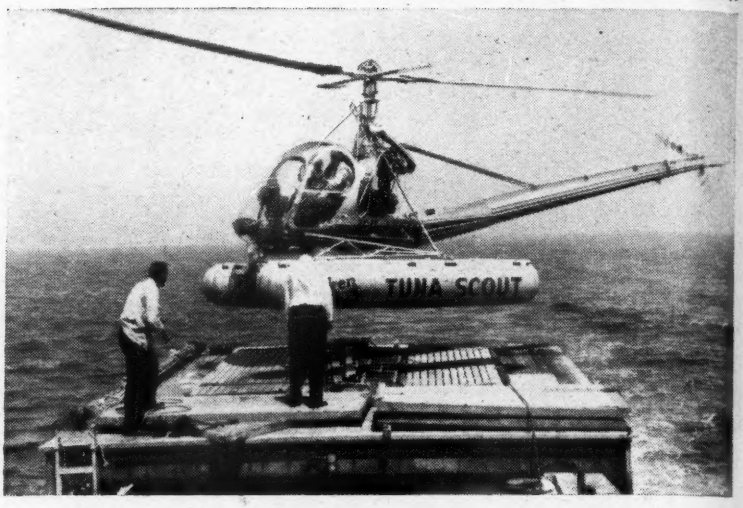
REPORTS of the demise of Operation *Plainfare*—originally stated to have occurred on September 23rd, appear to have been premature. An announcement from Berlin says that the final flight was made on October 6th by a coal-carrying Hastings from Schleswigland, piloted by F/L. D. Harper. *Vittles*, the American part of the Air Lift, was concluded on September 30th.

P.R. Appointments

FORMERLY the M.C.A. Press officer at London Airport, Mr. G. D. H. Linton has now taken up an appointment with the Press section of Shell Petroleum, Ltd. His successor at Heathrow is Mr. Francis Butters, previously assistant Press officer of the Ministry of Civil Aviation.

Early Turbojet for U.S.

AS a symbol of Anglo-American technical collaboration during the war, the original Power Jets W1X turbojet, first power unit to be installed in the Gloster E.28/39 (for taxying trials), will be presented to America at the Smithsonian Institute in Washington on November 8th. Air Commodore Sir Frank Whittle and Mr. W. E. P. Johnson, the managing director of Power Jets (Research and Development), Ltd., will fly to America to attend the presentation, which will be made by the British Ambassador. The Power Jets W1, the unit which powered the E.28 during initial flight trials, will retain a place of honour in this country—at the Science Museum, South Kensington.



HOOK, LINE AND HELICOPTER: Now on a two-month tunny-fishing tour, the 500-ton *Esperito Santo* carries a radio-equipped "sea scout" in the form of this amphibious version of the Hiller 360 light helicopter. Its flight deck, seen above, is the top of the 20ft-square bait tank.

It Does Seem Odd

"PRIMITIVE man must have watched the birds fly. He must have seen the gull doing no work, but gliding at an angle of about 1 in 12 or remaining still when he found a rising current of air. It seems odd that nobody ever tried to make a machine on those lines. There is nothing in the manufacture of a glider which could not have been done 2,000 years ago"—Lord Brabazon, speaking at the Gauge and Tool Makers' Association luncheon in London last week.

More Pole-squatting

THE 1,008-hr American endurance record established by Dick Riedel and Bill Barris on April 26th has been broken by two pilots from Yuma, Arizona—Bob Woodhouse and Woody Jongeward. Like the previous holders, they flew an Aeronca Sedan, and received fresh supplies and fuel from a car driven at speed along the runway.

Woodhouse and Jongeward, who are former Navy pilots, took off from Yuma on August 24th and broke the record last Thursday, October 6th. Their aircraft, *City of Yuma*, was due to land yesterday. It is reported that a crowd of 10,000 people were at Yuma Airport to celebrate the new record; whistles, sirens and hooters were blown, and the local police held a fireworks display.

High-altitude Research

A GROUP of five balloons, carrying an 11.5 lb load of cosmic-ray-research instruments, last week reached an altitude of 136,000ft (nearly 26 miles) over Pennsylvania. It is believed that higher altitudes have been recorded only by rockets. The world's absolute altitude record (i.e., for piloted aircraft, as recognized by the F.A.I.) is held by an American Army balloon, which reached a height of 72,395ft in November, 1935.

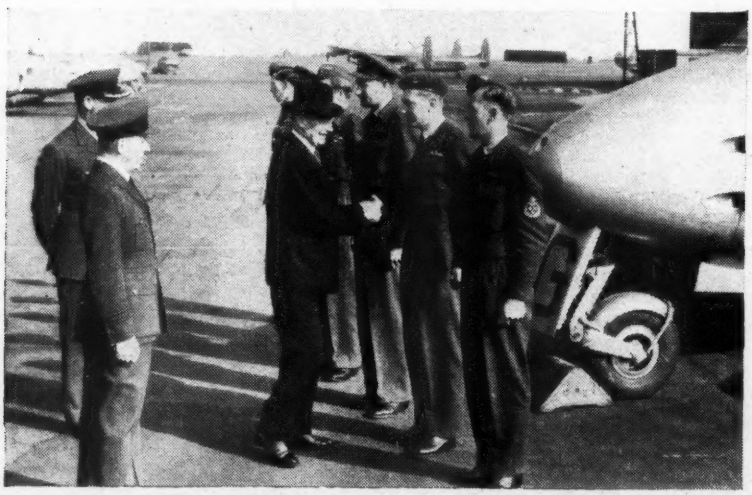
D.H. Designer Resigns

IT is learned that Mr. W. J. Jakimiuk has resigned from the de Havilland Aircraft of Canada, Ltd., to which company he had been chief designer since 1940. Among successful designs for which Mr. Jakimiuk had been responsible are the Chipmunk trainer and the Beaver bush transport; and his recent activities included development of the D.H. 113, night fighter version of the Vampire. Before the war, he designed the series of Polish P.Z.L. fighters, which were adopted by the air forces of five European countries, and the 14-passenger twin-engined Wicher transport for Lot, the Polish airline.

Stowaway Sentenced

AT Wealdstone on October 4th, Robert Green, a 22-year-old student, was accused of having "committed an act likely to imperil the safety of an aircraft, to wit, Lancastrian G-AGUM, by stowing away thereon." The case is believed to have been the first of its kind to come before a British court.

Capt G. M. Alcock gave evidence that when he took off for the Azores on August 26th, carrying freight and mail, Green's presence in the tail of the aircraft upset trim and considerably increased the take-off run. It was further



VISITATION: The Prime Minister, Mr. Attlee, last week made personal acquaintance with both defending and attacking participants in the recent air exercises. Travelling from Northolt in a Transport Command York, he visited the Meteor Wing at Horsham St. Faith, shown above, and the U.S.A.F. B-50 Group at Marham.

HERE AND THERE . . .

pointed out that the compass might easily have been affected, and that there was a risk of control cables being jammed. Green, who stated that he had 110 hours' flying experience, was sentenced to three months' imprisonment.

Jetliner on Show

CANADA'S first—and the world's second—turbojet-powered airliner, the A.V. Roe Canada C-102 Jetliner, was demonstrated in public for the first time at Toronto on October 5th. It was flown by "Jimmy" Orrell, chief test pilot of the parent Avro concern in England, and the demonstration flight, which was described as "epoch-making" by Mr. C. D. Howe, the Canadian Defence Minister, included an impressive zoom climb.

NEWS IN BRIEF

ACCOMPANIED by General Vandenberg, U.S.A.F. Chief of Staff, and Mr. Stuart Symington, Secretary of the Air Force, Marshal of the R.A.F. Lord Tedder paid a courtesy call on President Truman on October 5th.

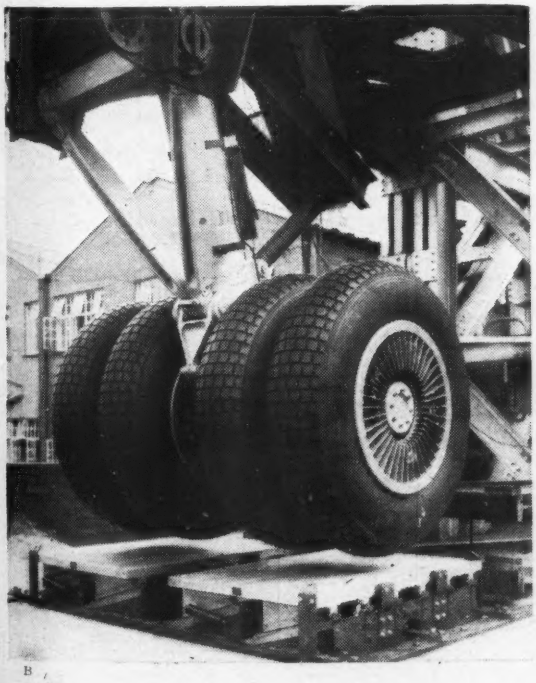
* * *

Colin Smith, one of the two brothers who crossed the Atlantic in a small sailing boat, recently visited Saunders-Roe, Ltd., where he was presented with a model of the Princess flying-boat. Colin Smith served his apprenticeship with the firm, and returned there after the war.

* * *

Mr. E. C. McKinnon, M.I.E.E., for 45 years chief engineer of the Chloride Electrical Storage Co., Ltd., (makers of Exide batteries), relinquished the post on October 1st, and is succeeded by Mr. C. P. Lockton, M.Sc.Tech., A.M.I.E.E., his deputy. Mr. McKinnon will continue to act in a consultative capacity.

LINE OF FIRE: Smoke from fuselage-fitted Jato units traces the take-off run, steep initial climb and levelling-off of a Lockheed P2V Neptune from the U.S. Navy's carrier, *Franklin D. Roosevelt*. Among the P2V's passengers were Mr. Louis Johnson and Mr. Stuart Symington, Secretaries, respectively, of Defence and the Air Force.



RENEWED ACQUAINTANCE: Before taking the Brabazon on her maiden flight, Bristol's chief test pilot, "Bill" Pegg, paid a visit to Fort Worth, Texas, where his Convair counterpart, B. A. Erickson, initiated him in flying the "Brabsize" B-36. Mr. Erickson recently returned the visit, and is seen with Mr. Pegg at Filton.

CROSS CHECK: To simulate cross-wind landing conditions the parallel sliding chocks, seen beneath one of the new Dunlop twin-wheel, four tyre, main undercarriage assemblies for the Brabazon I, were installed by Dowty Equipment, Ltd. They were used in conjunction with the massive drop-test rig.

A useful brochure on the characteristics of "Holdtite" industrial adhesives has been prepared by Surridge's Patents, Ltd., Croydon Road, Beckenham, Kent.

* * *

Mr. A. H. Nisbet, managing director of Bowden (Engineers), Ltd., Willesden, London, has recently resigned owing to ill-health, but retains his position on the Board. He is succeeded by Mr. H. G. Gilchrist, D.S.O., M.C., M.I.Mech.E., M.I.E.S.

* * *

Mr. L. H. Halling, who was formerly on the south-eastern area sales staff of High Duty Alloys, Ltd., has been appointed sales area manager for Scotland, Northern Ireland, Cumberland, Durham and Northumberland. He is, for the time being, at the company's factory at Winscales, Workington, Cumberland.

* * *

Mr. A. T. Roberson, chief planner of the Fort Dunlop group of factories and factory manager of St. Mary's Mills, Leicester, has been appointed works director of Dunlop (South Africa), Ltd., in succession to Mr. E. E. Quinton, the new general works manager of their Speke factory. During the war Mr. Roberson was engaged on special duties at the Ministry of Aircraft Production.

* * *

By a new forming process for sheet-metal parts, the Glenn L. Martin Company claims to have established new standards of low production cost and high precision in such work. They state that stainless-steel exhaust stacks, previously produced by drop-hammer at three or four per hour, can be made at 50 per hour.

* * *

Mr. Frank G. Woollard has relinquished his active work in connection with the Birmingham Aluminium Casting (1903) Co., Ltd. and the Midland Motor Cylinder Co., Ltd. He retains his seat on the boards of these companies and will continue to represent the former on the executive committee of the Aluminium Development Association and the Council of the Zinc Alloy Die Casters Association.

* * *

On October 18th the third annual general meeting of the Institute of Navigation will be held at the Royal Geographical Society, London, followed by the annual dinner at the Connaught Rooms, when H.R.H. Prince Bernhard of the Netherlands will be the guest of honour. The president, Sir Harold Spencer Jones, F.R.S., who will be in the chair at the meeting, is retiring, and Sir Robert Watson-Watt, C.B., F.R.S., will succeed him.

THE FRENCH AIRCRAFT INDUSTRY

PART II: Present Reorganization Schemes: Prospects for the Future

IN Part I of this article, published last week, the author reviewed the factors—particularly those arising from the enemy occupation of France—which have contributed to the unsatisfactory state of the nation's aircraft industry. In this instalment he describes various measures (they include some degree of limitation of State ownership) which have been adopted with a view to putting aircraft and engine development and production on a sounder basis. The writer has for many years been closely connected with the French industry.

FROM the facts given in Part I of this review the situation of the French aircraft industry at the beginning of the present year may be summed up as follows:—

(1) The aircraft replacement plan, as well as the work of the flight-test departments, is behind schedule owing to absence of prototypes ready for series production. The test programme was too ambitious to enable the tests of each type of aircraft to be carried to their proper conclusions, and financial resources were too restricted.

(2) Not all the aircraft met the requirements of their users, either because their quality was below expectations or because the performance of the prototypes (which took too long a time to reach the stage of practical application) was in the meantime surpassed by that of foreign models.

(3) Quality of equipment and accessories has notably improved, but France is still short of good engines in the higher-powered categories.

(4) The financial administration on which the French industry depends, with dozens of provisionary allocations spread over part of the year, considerably hampers a production programme which ought to be able to expand as time goes by without fear of cuts resulting from budgets belatedly passed by the Government.

Credits accorded to aircraft production are insufficient to realize a development and production programme of the wide scope originally envisaged. As has already been remarked, the war made it impossible for France to install experimental plant such as was set up in other countries. Therefore, in addition to the sums necessary for production, considerable investments for the creation of modern research establishments are essential.

For these reasons the Government decided to institute a new enquiry* into the whole problem in the hope of arriving at a really effective solution. At the instigation of M. Jean Moreau, Secretary of State for Air, representatives of the different user groups were brought together in a committee under the chairmanship of M. Surleau, Councillor of State and old-time collaborator with M. Dautry on the occasion of the reorganization of the French railways.

The task undertaken by the Surleau committee was of a manifold nature:—

(1) Enquiry into the different needs of the military and civilian production sectors.
(2) Fixing of a "balance of resources" which could be reserved for the benefit of the industry.
(3) Restricting the existing test and production programmes to the level judged to be necessary for satisfying requirements without overburdening the financial and technical resources of the country.
(4) Reorganizing the industry with the aim of increasing its efficiency.
(5) Ensuring proper investment of the sums allocated for development and production by setting up a five-year plan which should, as far as possible, be freed from dependence on the annual budgets.

This task was accomplished in less than six months. The method of procedure was similar to that of the United States Air Policy Commission, i.e., factories were visited and technicians and aircraft-users interrogated. The committee also worked on the technical information at the disposal of the Secretary of State for Air and then submitted its suggestions to the Government. They were duly adopted.

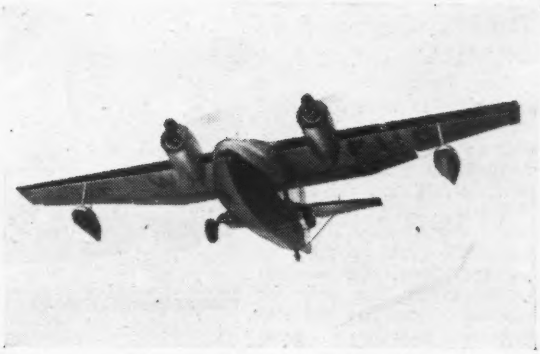
As a result, it is intended to reorganize the industry on the lines briefly explained below. In the first place, to avoid undue splitting-up of test and production resources the users are to define their requirements explicitly. Aircraft types will be standardized as far as possible, and the same type, with slight modifications, will be made available for similar applications (e.g., civilian cargo-carriers and military transports, touring aircraft and Air Force liaison types, etc.). About 15 different categories emerge from this concentration; certain too-ambitious designs are being left out and others which are only needed in small

TABLE II: CONCENTRATION PLAN FOR STATE-OWNED COMPANIES

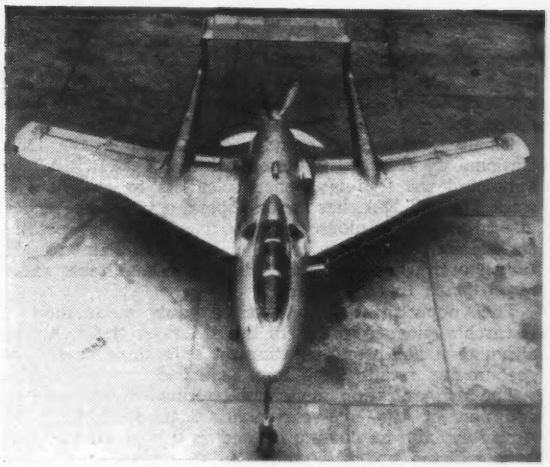
Company, Factory and No. employed	Present Work	Factories Left after Reorganization	Remarks
Airframes:—			
S.N.C.A.S.E. (South-East)			
Toulouse (3,500)	SE.2010, Bloch 161, prototype development, parts of M.D.315	Toulouse	
Marignane (1,500)	Prototype development, S.E.-1010	Marignane	
La Courneuve (1,200)	Mechanical engineering, reconversion	—	Earmarked for agricultural machinery.
S.N.C.A.S.O. (South-West)			
Courbevoie (1,600)	Prototype development	Courbevoie	
Bouguenais (1,000)	Aircraft parts and reconversion	Bouguenais	
St. Nazaire (1,800)	Assembly of S.O.30	St. Nazaire	
Suresnes (1,000)	Assembly of S.O. 94/95	To be returned to civilian sector	Factory ceded to S.N.E.C.M.A.
Bordeaux (1,300)	Maintenance and repairs, spare parts		Bordeaux factory to be utilized for repairs to civil aircraft.
Rochefort (500)	Do.		
S.N.A.C. (Centre)			
Bourges (1,100)	N.C.211, Siebel	Factory earmarked for S.N.C.A.S.O.	S.N.A.C., as a company, to be closed down.
Chateauroux (900)	N.C.211		
Billancourt (1,800)	Prototype (NC.270)	To be returned to civilian sector	
Fourchambault (700)	Tool equipment, landing gear		
Colombes (2,000)	Reconversions (tractors)	—	Agricultural machinery.
S.N.C.A.N. (North)			
Le Havre (600)	Assembly of Nd. 1400	Le Havre	
Les Mureaux (800)	Prototypes and light aircraft	Les Mureaux	
Meaulte (800)	Spare parts	Meaulte	
Sartrouville (800)	Nd. 1400 spares	Returned to civilian sector	
Issy-les-Moulineaux (750)	Nd. 2200 and 2500 prototypes		
Engines:—			
S.N.E.C.M.A.			
Kellermann (4,500)	Piston engines and jet-units of high and medium powers	Kellermann	
Billancourt (1,500)	Low-powered engines	Billancourt	May later be taken over by Renault
Gennevilliers (1,600)	Forgings, tool equipment	Gennevilliers	—
Argenteuil (3,000)	Agricultural machinery	—	—

*Several enquiry committees have been amalgamated since 1947, including the Committee on the Costs and Efficiency of Public Services, and the Committee of Reorganization of the French Aeronautical Industry (chairman, M. Fouan).

The cleverly constructed and popular Norecrin.



An amphibian *à l'Americaine*—the S.C.A.N. 30.



A long-range naval fighter-bomber the S.O.8000.

THE FRENCH AIRCRAFT INDUSTRY . . .

numbers will be built under licence or purchased abroad.

Aircraft requirements will be estimated quantitatively and the depreciation of the machines taken into account, so that the tonnage of airframes to be built annually can be determined. From this figure, man-power and plant requirements can be estimated.

Plants at present at the disposal of the industry were inspected and it was decided (a) to limit the number of State-owned airframe-production companies to three, and (b) to release for other production purposes certain poorly equipped factories which represent an unnecessary handicap on an industry already too far expanded for the new production programme.

Finally, to palliate the effects of the cuts made in the preceding years the Secretary of State for Air and the Defence Minister have caused a Bill to be prepared based on a five-year plan of reconstruction. When the Assembly reopens, this Bill will be laid before it. If it is adopted it will ensure for aeronautical development that measure of continuity which it has up to the present lacked.

The structure of the industry before and after reorganization is summarized in Table II.

Weeding-out of a certain number of factories judged to be inadequately utilized, or inconveniently situated geographically, will obviously be accompanied by a diminution in the number of personnel necessary both for management and for production. The total number of 23,000 workpeople occupied in the national airframe production plants will drop to between 16,000 and 17,000. After the Argenteuil works, which are already mainly occupied with reconversion work, are returned to the civil sector the number of employees of S.N.E.C.M.A. will be reduced to about 7,500.

To the three nationalized plants should be added the privately owned factories, corresponding approximately to one-quarter of the volume of the nationalized section of the industry, at least in airframe production. Table III gives brief details of the factories in private ownership.

The aircraft equipment industry is almost entirely privately owned. As the companies received orders only for the supply of limited numbers of their products they were obliged to turn their attention to the manufacture of other more lucrative articles and showed reluctance to invest the large sums necessary for making high-class aircraft equipment. Therefore a State company for manufacture of this equipment has been created with the object of carrying out design and production of the equipment indispensable for the aircraft now in production.

With regard to undercarriages, the old-established firm of Messier resumed its activities on the cessation of hostilities and supplies the equipment for more than 70 per cent of the aircraft built in France.

In addition to the different production plants every company naturally has its own test department and there are also central research and test establishments.

After the flight tests carried out by the manufacturers, for the most part from their own airfields, new models are moved to the Centre d'Essais en Vol at Bretigny-sur-Orge, where they are handled by State test-pilots and technicians and possible modifications are studied. The Air Force,

TABLE III: PRINCIPAL PRIVATELY OWNED FACTORIES

Company	Factories	Present Work
Airframes:—		
Ateliers d'aviation Louis Breguet	Toulouse, Villacoublay, Anglet	Breguet 761, Breguet 890/892, Helicopter G 11.E
Société M. Dassault	St. Cloud, Boulogne, Talence	M.D.315,* M.D.450
Société de Construction Aéronavale (S.C.A.N.)	La Rochelle	S.C.A.N. 20 and 30
Castel Mauboussin	Aire-sur-Adour	C.M.100 gliders
Sté Morane et Saulnier	Puteaux Ossun	M.S.472/475
S.I.P.A.	Suresnes	S.I.P.A.11
S.E.C.A.N.	Le Havre	S.U.C. 10 Courlis
Engines:—		
Hispano-Suiza	Colombes	Nene turbojet
Cie Electro-Mechanique (S.O.C.E.M.A.)	Le Bourget	Research and development, TG.A 1 Bis and TGAR 1008 jet units
Turbomeca	Bordes (Pau)	Development of light-weight and other gas turbines
Société des Moteurs Potez	Courbevoie	Small piston-engines
Société Mathis		Small piston-engines

* Certain mass-production parts of the M.D.315 are made in the national factories.

THE FRENCH AIRCRAFT INDUSTRY

on their part, have their own test station at Mont-de-Marsan for practical assessment of the military value of new aircraft after the Centre d'Essais have completed their flight-testing. These two stations will probably be merged into one central establishment, not only for reasons of economy but also because nowadays technicalities and tactics are becoming more and more closely integrated.

For investigating all types of engines the Direction Technique et Industriel and S.N.E.C.M.A. have erected a base at Melun-Villaroche, where at the moment the latest prototype units are being put to test.

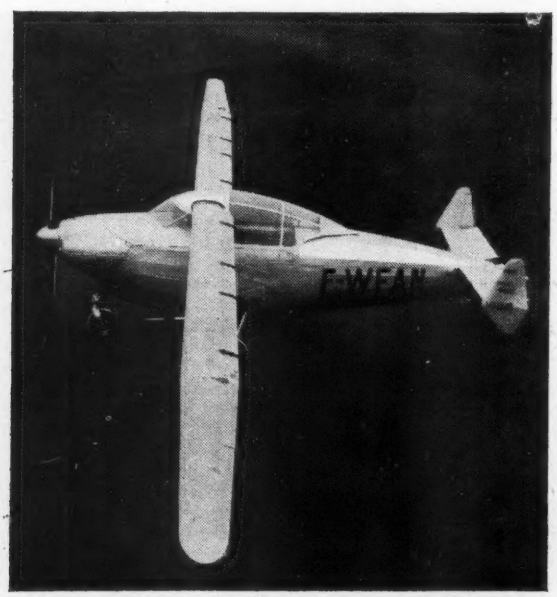
Finally, as regards aerodynamic research, the Office National de Recherches Aéronautiques (O.N.E.R.A.) has appointed the leading French scientists to carry out its work. O.N.E.R.A. has at its disposal a very large experimental plant at Toulouse; shortly, another will be operating at Modane, equipped with an eight-metres-diameter wind tunnel of 100,000 h.p. that will enable maximum speeds of 0.9 Mach to be reached.

The department has worked out a method of research analogous to that of the American N.A.C.A. and, although it has been operating for only three years, very encouraging results have been achieved.

The reorganization measures described above, and the adoption of the five-year plan of production by the Assembly, aim at putting an end to the vicissitudes that have afflicted one of France's vital industries. Concentration of production will, it is hoped, permit adaptation of the manufacturing programme to the needs of the market, and the economic regrouping of the factories should be followed by a considerable reduction in cost prices. Finally, with the passing of the Bill the Secretary of State for Air hopes to free the industry from the technical and financial fetters which have up to the present proved so embarrassing.

It may well be that in the years to come French technicians will concentrate their efforts on a small number of prototypes recognized as being indispensable for the nation and thus attain international standards of merit while reducing first cost by production in large numbers. As for the advanced research, French strategy as envisaged

The S.E. 2010 Armagnac, intended for Air France transatlantic service.



Unique prototype: the Hurel Dubois H.D.10-01.

TABLE IV: TYPES BEING MASS-PRODUCED, OR SUITABLE FOR MASS-PRODUCTION

Type No.	Characteristics	Built for	Remarks
FIGHTERS:—			
M.D.450 ...	Jet fighter	Air Force	May be redesigned for higher performance.
D.H. Vampire Mark 5	Jet fighter	Air Force	May be Nene-powered.
Nord 2200 or Centre 1080.	Carrier jet fighter ...	Navy	
S.O. 6020 or S.E. 2410 development.	Single- or twin-jet pursuit.	Air Force	Improved types in view.
FLEET RECONNAISSANCE :—			
Nord 1400	Patrol amphibian ...	Navy	In service for 5 or 6 years.
M.S. 472 ... 475	Improved single-engined two-seater.	Air Force and Navy.	In service for several years: could be fitted with turbo-prop.
S.I.P.A. 11...	Single-engined two-seater.	Air Force	
S.C.A.N.20	Seaplane trainer ..	Navy	
TRANSPORTS :—			
S.E.2010 ...	Large four-engined passenger or freight aircraft.	Air France	More powerful engines to be installed.
S.O.30P ...	Medium-weight twin-engined fast passenger transport.	Air France	Power to be increased: four-jet version under consideration.
M.D.315 ...	Light twin-engined machine.	Air Force and private concerns.	Long-service design; twin-jet version in view.
Breguet 761	Heavy four-engined cargo carrier.	Air France and private concerns.	For 6-7 years' service.
Nord 2500	Medium twin-engined cargo carrier.	Air Force	For 6-7 years' service.
Breguet 890	Medium twin-engined cargo carrier.	Air Force	For 6-7 years' service.
Breguet 892	Medium four-engined cargo carrier.	Private concerns.	For 6-7 years' service.
COMMUNICATIONS AND TOURING :—			
Nord 1100	Single-engined (220 h.p.) four seater.	Air Force, private owners.	Future programme unknown.
Nord 1200	Single-engined (140 h.p.) three- and four-seater.	Air Force, private owners.	Future programme unknown.
N.C. 853 ...	Single-engined (80 h.p.) two-seater.	Air Force private owners.	Future programme unknown.
S.I.P.A. 901	Single-engined (75 h.p.) two-seater.	Air Force, private owners.	Future programme unknown.

HELICOPTERS: All French helicopters are experimental types; it is probable, however, that machines evolved from the following types, which are now undergoing trials, could be produced on a mass-production basis:—S.E.3000 (two rotors), useful load, 2,200 lb: Centre 2001, geared-rotor helicopter; and G.11.E and S.O.1100 helicopters with reaction units.

in the Brussels Treaty and the Atlantic Pact imposes upon the country some special problems to the solution of which it will have to devote its attention. They include the development of tactical fighter aircraft capable of covering the colonial sphere of operations, while there is also the question of developing remotely controlled weapons. As regards civil aircraft the opening-up of the overseas territories calls for an aircraft adapted to the economic and climatic conditions of French Africa.

Table IV gives a list of the main types of French aircraft which are now, or are about to be, in large-scale production. In addition to these standard designs, research engineers are also working on some special types of particular importance to the nation. Engineer Leduc, for instance, is now perfecting his Leduc 010, equipped with a ram-jet. Developed from a design dating back as far as 1938, the 010 now flies at almost 900 km/hr (560 m.p.h.) and climbs 60 m/sec (11,800ft/min). A further machine is in course of construction.

In quite a different constructional sphere Hurel has revived the old idea of the wing with ultra-high aspect ratio, braced by a single lift strut on each side. The machine, the H.D.10, was flown at the Orly display; with a 40 h.p. engine it exceeds 200 km/hr (124 m.p.h.) and consumes only 5 litres (1.09 gal) of fuel for 100 km (62 miles). Probably a light transport prototype will be built to verify the accuracy of the results obtained with the small 40 h.p. plane.

The reorganization which has been described is a serious effort to give French aviation a "new deal," and the results will be watched with the greatest interest throughout the world.

AMERICAN DESIGN ANALYSIS

FOLLOWING the opening of the Royal Aeronautical Society's lecture season with the Commonwealth and Empire Lecture (September 15th), the second paper of the autumn session was given last Thursday, October 6th. On this occasion the lecture was delivered by Mr. Ivan H. Driggs, A.E., F.I.Ae.S., F.R.Ae.S.

As director of the Research Division of the Bureau of Aeronautics, U.S. Navy Department, Mr. Driggs chose as his subject the methods of aircraft design analysis evolved and employed by his department.

The lecture differed considerably from the usual type of R.Ae.S. paper in that the treatment was almost wholly mathematical. This is in no way to suggest adverse criticism; on the contrary, the paper must be assessed as being of material value to all whose work lies in the field of aircraft design and performance. The basis of the Research Division's method is the use of a mathematical-mechanical system of a type which can best be likened to a double infinite slide rule. The basic assumption upon which this system is based is that drag coefficient plotted against lift coefficient, with the effects of compressibility ignored, approximates to a parabola, and when this drag coefficient is plotted against the square of the lift coefficient, a substantially straight line will result with an intercept at zero lift equal to the minimum profile drag coefficient and a slope equal to $\frac{S}{\pi b^2 e^2}$ where

S=total wing area sq ft
b=span ft
e=span efficiency factor

After describing the working method of the system, the lecturer stated that the procedure was extremely flexible and could account for all the variables which might be encountered in the performance analysis of any aircraft. This flexibility also extended to the analysis of a series of aircraft, a matter which might be necessary before finally deciding upon any one design.

INTERPLANETARY ROCKETS

INTENDED to illustrate recent developments in rocket engineering, the *conversazione* held by the British Interplanetary Society in London on October 1st succeeded admirably and visitors were genuinely surprised by the considerable evidence of practical work—almost exclusively American—which had been brought together under one roof.

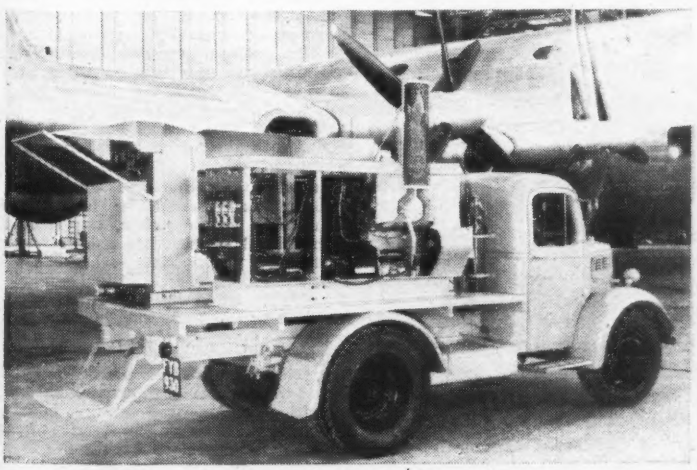
Most impressive among the Society's own exhibits was the display panel illustrating, in a series of models, the principle of the expendable-tank step-rocket proposed by K. W. Gatland and further developed by him in collaboration with A. M. Kunesch and A. E. Dixon.

The proposal is to break down the forward portion of the hull into separate tank stages which jettison progressively as propellant is consumed. Each stage consists of two half-cylindrical tank bays with integral structure which, on assembly, form an efficient hull. The component tanks are locked together with explosive ties and pressure balance is provided between them, allowing the use of light diaphragms for the backing panels.

Designs for a man-carrying rocket, based on the German A-4 (V.2), with a pressure cabin in place of a warhead, were also on view. The rocket, designed by R. A. Smith and H. E. Ross during 1945-46, is intended to carry an observer 180 miles into the upper atmosphere. It is thought that a useful series of physiological experiments—principally to determine the effects of acceleration and a condition of reduced or zero *g* could be performed after a few years' basic research and with minimum expenditure.

Another interesting proposal — believed to be the first of its kind—is a space-suit, comprehensively equipped for sustaining life in vacua. One of the designers, H. E. Ross, will be describing the suit in his lecture to the B.I.S. next month.

The Society now moves to larger quarters at Caxton Hall, Westminster, where it is proposed that most of its future meetings shall be convened.



STARTING THE BRAB.

A STANDARD two-litre "Bristol" car engine was incorporated in a specially built starting unit for the Bristol Brabazon I when the existing starter-unit proved to be inadequate, eight days before taxying trials commenced. Engine speed is controlled by an "Iso-speedic" governor which is so sensitive that it holds revolutions constant to within a few per cent of the required 4,000 r.p.m., even on sudden application of the full starting load.

The engine, without clutch or gearbox, is coupled directly to a 200-volt, three-phase alternator, which is coupled in tandem with a 30-volt generator for excitation of the alternator. In operation, the throttle is set, after a warm-up period, to give 4,000 r.p.m., and the governor is left in complete control while the unit supplies current to start the Brabazon's engines without further attention to the set.

All eight engines have been started, shut down, and re-started immediately afterwards without tap-changing taking place.

AMERICAN NOTEBOOK

By "Favonius"

DOUGLAS DIVERTISSEMENTS

WE confess—without a blush—that our linguistic knowledge of French has much the evanescent quality of a poorly designed rudder in a spin, so we looked up this label for a Douglas vintage in our favourite dictionary. "Divertissement," it said, is a short entertainment between the acts of a longer piece—and this translation seems to fit the present status of the Douglas Super DC-3, which is the standard "old faithful" now undergoing rejuvenation at Santa Monica. After about 20 hours of test flying, the Super DC-3 is now (at the time of writing) being re-tested with further revisions to its tail surfaces and at a higher gross weight.

For this reason we have kept company with the angels who fear to tread and purposely refrained from jumping in where the printers' devils love to leap, since during the divertissement phase there was little object in quoting facts that ceased to become facts before the printer's ink was dry. Thus, although a few weeks ago the maximum permissible take-off gross weight (with auto-feathering props) was quoted at 29,500 lb, the current figure is now 31,000 lb. Without the refinement (and current teething troubles) of auto-feathering airscrews, the maximum take-off weight is limited to 28,500 lb.

What we can say at this time, from personal inspection, is that although both the vertical and horizontal tail surfaces were increased in span and area over those of the standard DC-3, they have now been modified a second time. The dorsal and vertical fins have increased in area, with a corresponding increase in height of the rudder by some 15in. Likewise, a new horizontal tail about 3ft longer in span has been substituted for the earlier mod. The vertical-tail geometry is now strictly utilitarian, to the point of austerity. This is in keeping with Douglas design philosophy, which postulates that any unnecessary departure from the linear is purely emotional—as well as expensive.

Retailoring

Skipping, then, lightly over our aesthetic emotions and keeping strictly to bread-and-butter economics, we must judge the Super DC-3 conversion as a modern example of how to turn an honest dollar in a dollar-hungry world. The Douglas idea is akin to the time-honoured English custom of having one's suit turned inside-out and made as good as new for another ten years. (The canny Scot, we understand, is even more adroit—he merely wraps his kilt round the other way!) All you need is good material and sound workmanship in the first place which, in the case of Douglas, can be taken for granted.

Following this old-worldly fashion, Douglas plan to have operators return their DC-3s to Santa Monica for renovating to modern airworthiness standards. The standard DC-3, incidentally, reaches the end of its airworthy life some time in 1952, but the conversion plan is designed to meet the latest civil air regulations and should keep the Super DC-3 flying well into the next decade. The complete retailoring bill is expected to run somewhere between $150,000 and $200,000, which is less than half the price of a new twin-engined transport; the performance, moreover, will be little inferior to post-war types in the same class.

Included in this package conversion deal are two new 1,275 h.p. Wright Cyclones giving 550 more take-off horses than the standard DC-3 can muster. Weight and performance figures are now being finalized, but there is no reason to quibble over Douglas's estimate that the Super DC-3 will cruise at least 50 m.p.h. faster than its predecessor. At a gross weight of 31,000 lb and normal rated power of 1,275 h.p. per engine, the predicted top speed is 269 m.p.h. at 5,900ft while the cruising speed at 67 per cent of normal rated power is 250 m.p.h. at 15,400 feet. Because, however, the Super DC-3 is not pressurized, a more useful operational height is 10,000 feet, and at this height on 60 per cent normal power the cruising speed is 226 m.p.h.

Accommodation

As a short-haul transport, the former 21-passenger accommodation of the standard DC-3 has been superseded by a choice of three alternative interior arrangements seating 30, 31 or 37 passengers. This has been done by splicing an extra 39 inches in the fuselage structure forward of the wing, thereby adding one more cabin window on each side. The other main structural changes—apart from the new tail unit already noted—comprise an entirely new flush-riveted outer wing panel with more sweep-back and shorter span (90ft instead of 95); new kangaroo-type engine nacelles completely enclosing the main landing gear when retracted; and a partially retracted tail-wheel, leaving only the lower portion of the wheel exposed.

Less obvious retailoring touches include: a passenger door at the rear of the cabin, having bottom hinges and incorporating an integral stairway with hand-rail; an enlarged cargo hold aft of the cabin with a waist-high door easily accessible from the ground; and a new combustion-type cabin heating system, which also supplies hot air for anti-icing the pilots' bird-proof windshield. The landing gear retraction and wing flap hydraulic system has also been reworked from 800 to 1,100 lb/sq in pressure, an increase which cuts down the landing gear retraction time to 7 sec.

This new replacement plan for the DC-3 global work-horse should provide a good standby bread-and-butter business for Douglas. It certainly makes a lot better sense, in our opinion, than did Douglas's earlier bid for this market in 1947 with the proposed DC-9, which blew hot and cold for many months. The DC-9, it may be recalled, was a 30,000 lb 28-passenger twin using the same type engines as the Super DC-3. About the only post-war innovations it could claim over the latter were a nosewheel landing gear and structural provision for cabin pressurizing. The passenger revenue potential would have been lower and the capital cost more than double—probably triple, with the added complications of pressurization.

Anyway, now that this latest divertissement has crossed the boards and been shown to the public, our Douglas engineering friends will be able to return to the *pièce de résistance*—they can pin a new sheet on the drawing board and rework-up that new jet transport which has been in the study stage for the past year or so. We say "rework" with our tongue-in-cheek because we have a hunch that the recent air disclosure of the D.H. Comet will cause a lot of rubbing out and redrafting on American drawing boards. Which in itself would be divertissement in this dollar-conscious world.

"Executive model" of the Douglas Super DC 3, now on a demonstration tour.

PILOTS' PAY

An Examination of the Position : B.A.L.P.A.'s Views

THERE has recently been a good deal of discussion on the subject of pay, insurance and pensions for civil aircrew, and in particular for pilots employed by charter operators. *Flight* has already referred to this matter, which has been brought to the fore by the award of the Industrial Court to which the British Air Line Pilots' Association and the British Air Charter Association—both members of the National Joint Council for Civil Air Transport—submitted their differences for arbitration on August 18th last. The Court found, on August 24th, that the terms and conditions of employment of the pilots concerned ought to comply with the requirements of Section 41 (1) of the Civil Aviation Act, 1946.

This amounts to an order, which may be regarded as having legal force, that charter pilots must receive terms and conditions no less favourable than those enjoyed by pilots in the Corporations. The terms of Section 41, however, qualify the award with the phrase "persons engaged in comparable work," and around this have developed many of the arguments. Is charter operation in a Dakota or Rapide directly comparable with year-round Corporation flying in the same type of aircraft?

The finding, as might have been expected, favoured B.A.L.P.A. views, but took the matter even further than this Association had wished, and thus caused some embarrassment to both parties. The points under dispute were, broadly, the salaries of charter pilots, especially those flying Rapides and other aircraft in the same class; accident insurance; and pensions.

An examination of the position of the negotiations prior to their reference to the Industrial Court seems to indicate that there was a considerable measure of agreement between B.A.C.A. and B.A.L.P.A., who are believed respectively to represent nearly 50 per cent of the operating concerns and 20 per cent of non-Corporation commercial pilots. Moreover, there is reason to believe that all but the proposals for pensions could have been sorted out without reference to the Court. B.A.L.P.A. state that they now have no intention of pressing for the pension scheme as originally formulated, and are agreeable to a much modified arrangement closely approximating to those which have been and are in force with most of the reputable charter companies.

Cost of Pensions

It is pertinent to recall that, although a pension scheme along the lines laid down has been accepted in principle by the Corporations, the details have still to be worked out and agreed after more than three years of waiting. Without going into details, it has been calculated that to accept a pension (or equivalent endowment scheme) with the benefits laid down (£350 p.a. at 40 years, rising to £650 p.a. at 50 years for pilots entering service up to the age of 30 years), together with the normal accident insurance, would, in the case of a pilot receiving £1,000 p.a., increase his apparent salary to between £1,500 and £1,600 p.a. This no operator could possibly afford, as B.A.L.P.A. agrees.

To return to the salary scale and conditions of employment, most of the larger private operators are already offering equivalent conditions and paying salaries as high as (and in some cases, higher than) those of the Corporations for pilots with comparable experience and responsibilities. The small operators with from one to, say, half a dozen aircraft no heavier than the Rapide or Consul, and including Proctors and Austers, are unable to offer high salaries.

In certain very important respects the views of B.A.L.P.A. are at variance with those of B.A.C.A., G.A.P.A.N., many commercial pilots and, incidentally, ourselves. The Association believes, for instance, that a number of the small charter operators are of no value to the transport movement, and, in fact, are a discredit to it; that they will eventually, and should, cease to operate; and that the sooner this happens the better. Moreover, it is claimed that there is evidence to show that those companies which pay their pilots less than the recommended rates operate with reduced safety margins because, it is alleged, the pilots concerned, give only a quality of service comparable with their pay. *Flight*, let it be said, has not discovered or been given any such evidence. There have been isolated instances of what may be called the "cut-throat" operator taking unjustifiable risks by overloading or cutting down on crew-qualification and navigational aids. There have also been cases of pilots being paid at a rate which they themselves should have refused to accept. These, we believe, are isolated examples. The fact remains that B.A.L.P.A. makes what amounts to serious allegations as to the integrity of a number of commercial pilots by stating that they would do less than their best if paid less than B.A.L.P.A. think they should be. If there is, in fact, any truth in the claim that some operators are not observing proper standards of safety, it is for the M.C.A. to take appropriate action. A call for standardized pay for the pilots is scarcely relevant. Incidentally, B.A.L.P.A. is the self-appointed negotiating body for all commercial pilots, whether they are members and seek the Association's help or not. We do not, however, propose to enlarge on this aspect, which is one that involves the whole principle of trade unionism.

Status of Pilots

Certain points emerge from these considerations, and one of them—namely, the status of a pilot—has been raised in *Flight's* correspondence columns and elsewhere. First, it must be mentioned that we have found no reputable operator, large or small, who does not agree that a pilot should have pay commensurate with his responsibilities and experience (this to include an agreed minimum figure) and adequate insurance cover. Moreover, it is accepted that some provision must be made for the pilot after the age of, say, 45. However, as has been stated before, most professional men in other walks of life would consider their status and the prestige of their profession to have been lowered if an organization was set up to negotiate their salaries and terms of employment for them. Some pilots think differently, but the majority prefer freedom of action so far as seeking and negotiating employment is concerned. B.A.L.P.A. is certainly as it states, thinking of the future of some pilots, though most of these—employed by the Corporations—are already looked after by the Civil Aviation Act. By an unrealistic and completely unsympathetic approach to the problems of the great majority of charter operators, however, they would remain disinterested spectators while a large number of other professional pilots lose their employment. Admittedly, political considerations again enter into this picture. A B.A.L.P.A. spokesman has mentioned, incidentally, that his Association is not concerned with taxi and comparable services run by the surviving flying clubs.

Already some charter operators are considering what action will be necessary to offset the conditions of the award. Although the demands for an expensive pension scheme are not being pressed at the moment, there is the fact that, once their hand is forced on the other two items in question, the third will not be long delayed. Regular flying staffs will probably be reduced to that minimum which is required for winter operations, and pilots for the summer peak period will be employed only on a temporary basis. A large pool of pilots will be created, consisting of men with varied experience living a day-to-day existence and without the facilities for keeping themselves in constant practice either in the air or in synthetic trainers. Although many pilots will leave aviation, others will continue, either because of their love of flying and their hope that trade may improve or through their inability to earn a living in any other sphere.

British airline pilots enjoy privileges, protection and security which, happily for them, do not depend on the fortunes of their employers. We would be the first to applaud the introduction by charter companies of such protection and security of employment, together with privileges such as free facilities for constant practice and licence qualification. But we are also realists, as (we believe) are also the charter companies and their pilots. We believe also that many members of B.A.L.P.A. do not wish to harm their colleagues—who, for other reasons, they envy.

BRITISH MESSIER REORGANIZATION

IN order to strengthen the link between British Messier, Ltd., and Rotol, Ltd., The Bristol Aeroplane Co., Ltd., has recently transferred to Rotol its interest in British Messier.

In addition to the existing British Messier directors, Mr. J. Reid and Mr. W. Masterman have been appointed to the Board. Mr. Reid is general manager of Rotol, and Mr. Masterton, who is secretary of the Bristol Company, has hitherto been, also, secretary of British Messier. Mr. D. A. Tomlinson, secretary of Rotol, has been additionally appointed secretary of British Messier.

CORPORATIONS' ACCOUNTS

British Airline Losses for Year Ended March 21st, 1949

THE Reports and Accounts of the three Airways Corporations for the year ended March 31st, 1949, have been laid before Parliament by the Minister of Civil Aviation and are published by H.M. Stationery Office, price B.O.A.C. 1s 3d, B.E.A.C. 1s 3d, and B.S.A.A. 1s.

The aggregate loss amounts to £9,740,000 compared with a loss of £11.09 millions in 1947-48—a decrease of 12.2 per cent. This reduction in loss was accompanied, however, by a substantial increase in output. Over 132 million capacity ton-miles were flown on air transport services compared with 100 million capacity ton-miles in 1947-48—an increase of 32 per cent. Revenue ton-miles also showed an increase; 719,526 passengers were carried, 92,331 more than in the previous year, and the passenger-miles flown increased by 20 per cent from 471 millions to 566 millions.

Briefly, the results achieved by individual Corporations were as follows:—

B.O.A.C. produced 34 per cent more capacity ton-miles than in the preceding year and costs per capacity ton-mile were reduced by 16 per cent. The net deficit incurred by the Corporation was £5.84 millions, or 16.2 pence per capacity ton-mile, a reduction of 38 per cent over the previous year. Staff was reduced from 21,844 to 18,920, while the output per employee rose from 3,005 to 4,565 capacity ton-miles.

B.E.A.C. produced 33.1 per cent more capacity ton-miles than in the preceding year, and unit costs were reduced by 19 per cent. The net deficit was £2.76 millions, or 25.2 pence per capacity ton-mile, a reduction of 42 per cent from the previous year. Staff was reduced from 7,069 to 6,324, while the output rose from 2,742 to 3,685 capacity ton-miles per employee.

B.S.A.A.C. results were adversely affected by the delay in the introduction of the Tudor aircraft and by their withdrawal from service in January, 1949. Capacity ton-miles increased by 27 per cent, but unit costs increased by 15 per cent. The net deficit was £1.13 millions, or 14.2 pence per capacity ton-mile, compared with £0.42 millions, or 6.7 pence, in 1947-48. Staff increased from 1,505 to 2,088 and the output per employee fell from about 11,500 to 10,296 capacity ton-miles.

The improvement in output, and in the reduction of unit operating costs of B.O.A.C. and B.E.A.C. are said to reflect only the initial results of the measures of reorganization and economy which were introduced during the year under review. As was foreshadowed when the provisional operating results for the first half of the financial year were published in December, 1948, those measures have not had time to exercise full influence on the financial results for the year. However, considerable reductions in unit costs have already been achieved. The aggregate figures for the three Corporations—after taking into account the adverse effect on B.S.A.A.'s results of the withdrawal of the Tudors—are as follows. The cost of operation was reduced from 68.5 pence per capacity ton-mile in 1947-48 to 58.9 pence in 1948-49, a reduction of 14 per cent. The staff of the Corporations was reduced from 30,418 in March, 1948, to 27,332 in March, 1949, a reduction of 3,086 employees. The individual output, expressed in terms of capacity ton-miles per employee, rose from 3,218 in 1947-48 to 4,668 in 1948-49, an increase of 45 per cent.

Certainly one of the most encouraging aspects in the report is the increase in capacity ton-mileage. There is, however, no indication of whether this has been achieved by increasing frequencies or through the opening of new routes. While the cost per capacity ton-mile flown has been reduced in each Corporation the deficits remain high and although expansion is unquestionably desirable the cost should remain a limiting factor. It would be enlightening to know what losses would have been incurred if the Corporations had consolidated, instead of increasing their capacity.

Uneconomic Aircraft

The accounts for the year ended March 31st, 1949, refer to a period when B.O.A.C. in particular were still operating uncompetitive aircraft of converted military design and plans for re-equipping with more modern types had not been realized (through no fault of the operator). Training organizations were established for both the Stratocruiser and Hermes, with accompanying financial outlay, but due to late deliveries this could not be offset by revenue.

Both B.O.A.C. and B.S.A.A. have suffered from what is termed in the report "the Tudor gap." Apart from the direct financial losses which resulted from the Tudors' withdrawal both airlines were left without replacements. B.E.A., on the other hand, had developed the Viking and its Hercules engines and there has been a gradual reduction in the operating costs of both throughout the period. Internal services have been maintained with Dakotas and Rapides but the latter have been described as fundamentally uneconomic. Each report is optimistic of the future although B.E.A., with interests mainly in Europe, is naturally rather sceptical about prevailing conditions. In the current year B.O.A.C. look forward to introducing types of aircraft which should help to improve their financial position. Each Corporation has exceeded its own Exchequer grant. B.O.A.C.'s excess amounts to £594,695, B.E.A. to £613,085 and B.S.A.A. to £633,082.

PRINCES FOR THE NAVY

A CONTRACT for a number of Prince aircraft has been awarded to Percival Aircraft, Ltd., of Luton, Beds, by the Ministry of Supply on behalf of the Admiralty. The Princes are to be used for training and communications purposes.

The basic Prince, an 8/12-passenger machine, is powered by two 520 h.p. Alvis Leonides engines. Its roomy fuselage, with 6ft headroom, is well suited for fitting up as a flying classroom to accommodate the comprehensive equipment required in the training of Naval air crew.

NEW NAMES AND NUMBERS

SMALL in themselves, the following news items concern important and interesting new aircraft and power plants now under development, or in production, in this country:

An early variant of the Rolls-Royce Avon axial-flow turbojet is designated R.A.2 and delivers 6,000 lb static thrust at sea level.

The de Havilland Ghost D.Gt.3 is rated at 5,000 lb sea-level static thrust.

The new Percival trainer, to which reference was made in *Flight* of September 29th, is styled P.56. Like the new Handley Page trainer—the H.P.R.2—of which previous mention has also been made, this type is powered with an Armstrong Siddeley Cheetah 17 engine.

Sedbergh TX1 is the designation of the glider trainer produced by Slingsby Sailplanes, Ltd.

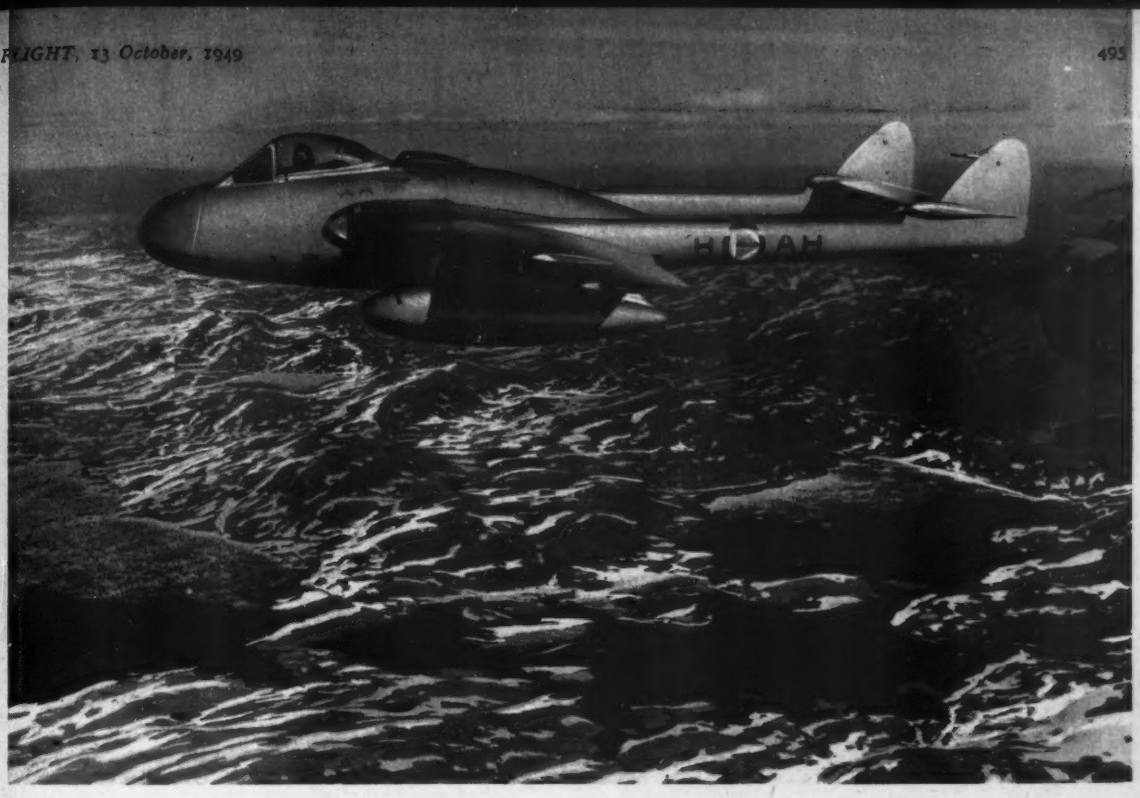
R.A.F. RESERVES CLUB DINNER

IN a presidential speech at the first annual dinner of the R.A.F. Reserves Club, held in London on October 7th, Air Chief Marshal Sir Guy Garrod expressed conviction that a permanent and regular R.A.F. could not possibly thrive without the backing of a strong volunteer and reserve movement. Replying to Sir Guy's toast of "The Visitors," Air Chief Marshal Lord Dowding, the guest of honour, spoke with feeling on the disastrous effects which another war would have. "If it were possible for the peoples of this world to set their minds steadfastly against war," he said "we should not have one." The toast, "The R.A.F. Reserves Club," was proposed by Air Marshal Sir Hugh Saunders. Music during the evening was provided by the R.A.F. Central Band. Some 200 people attended, and guests included Air Marshals Sir Leslie Hollinghurst and Sir John Baker, and A.V-M. R. M. Foster.

EFFECTS OF HEAVY RAIN

A METEOROLOGICAL OFFICE pamphlet* by J. Sawyer, M.A., gives an account of investigations carried out to determine the importance of the various factors which may combine to cause a downward motion of an aircraft in heavy rain. This phenomenon has been noticed by many pilots when flying through tropical downpours. The notes comprise some convincing data in support of their conclusion that the most important factor in producing downward air currents is the cooling of the air by evaporation of the rain.

* *Met. Office Professional Notes No. 99, price 2d.. H.M. Stationery Office.*



"NOROWAY O'ER THE FAEM"

(*From "The Ballad of Sir Patrick Spens"*)

NORWEGIAN scenery and British aircraft afforded these magnificent but contrasting studies. The snows which vein the hills beneath the de Havilland Vampire 3 of the Royal Norwegian Air Force persist the year round. Less forbidding but, in its way, of equal grandeur, is the terrain round Oslo, where Vickers-Supermarine Spitfire 9s are seen at exercise. British aircraft of the type shown, together with Mosquitoes, form the nucleus of Norway's air force.

SOUVENIR OF

TWENTY-EIGHT entrants who took part in the International Tour Aerien de Suisse, held recently in the Swiss Alps, now have pleasant memories—some of which are recalled photographically here—to carry them through the winter months. Enjoyment of the sometimes formidable scenic glories of the route from Zurich to Basle (via Grenchen, Lausanne, Berne, Locarno and Sion) was supplemented by interest in the daily contests of flying and navigational skill. Among the participants from eight countries were four British pilots, and one of them, Mr. O. V. Holmes (Hornet Moth) won the precision landing competition. M. Genin, of France, flying an Ercoupe, gained the prize for the regularity flight and among the other awards was a prize for the highest number of points obtained during the entire six-day rally; it was won by Herr Spahni, Switzerland (Avia FL5).

Weather throughout the tour, although often a little cloudy, was safe enough not to mar the enjoyment of the rallyists. Tri-lingual banquets were organized by local clubs along the route and provided some long-to-be-remembered evenings. At Berne the party was joined by several prominent figures in Swiss military and civil aviation circles and the flight continued to Basle, where the rally was brought to a close by a farewell banquet and the distribution of prizes.

(1) No place to land—the great Aletscher Glacier, where some scenes for *Scott of the Antarctic* were filmed.

(2) Herr Walter Spahni flying his Czech Avia FL5 during the "target-finding" contest, which was won by M. Arnaud (Piper Super Cruiser).

SWITZERLAND

(3) Dr. Stocklin, of Zurich, in a Miles Whitney Straight, was one of the prizewinners in the aggregate points competition. Note the downward-and-forward observation panel beneath the windscreen.

(4) United Nations at Basle Airport: seen here, left to right, are Marcel Doret (France), Frau and Herr Koepke (Switzerland) and their daughter, Jan Anderle (Czechoslovakia), and Mme. and M. Willi Farner (Switzerland).

(5) Inside: Lunch in the hangar at Grenchen, in the Jura Mountains.

(6) Outside: Participants' aircraft lined up during lunch at Grenchen.

(7) On the flight from Locarno to Basle—country over which even the sweetest engine often sounds a little rough.

(8) Mme. Olive Marmol, wife of the well-known Czech sailplane pilot, goes aboard her husband's British-registered Proctor.

(9) Tri-lingual briefing by Capt. H. Schreiber and Herr E. Lauber (right) assisted Major Hörning in shepherding the flock safely round the Alps.

(10) The Miles Whitney Straight flown by Dr. Max Stocklin (Switzerland).

(11) The winner of the "general classification," or aggregate prize: Herr Walter Spahni and his passenger, Herr Klipstein, in the Avia FL5

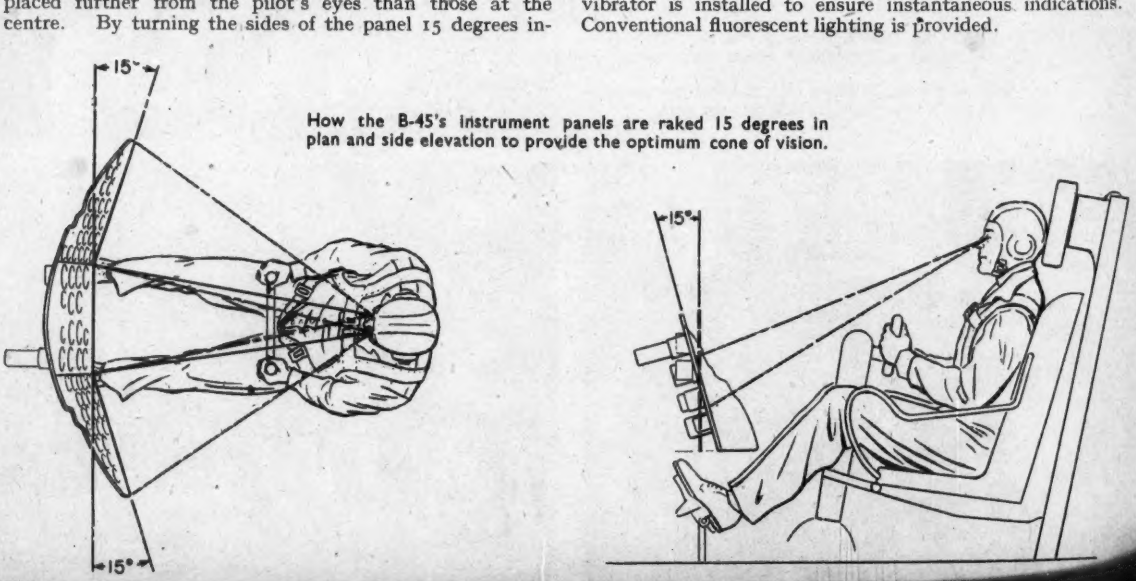
(12) Major Walo Hörning gives information on the next day's flight while minds are still receptive at the Berne banquet.

(13) The president of the Italian flying club at Locarno-Magadino addresses the party before the flight across the Alps.

Captain's panel on the B-45.

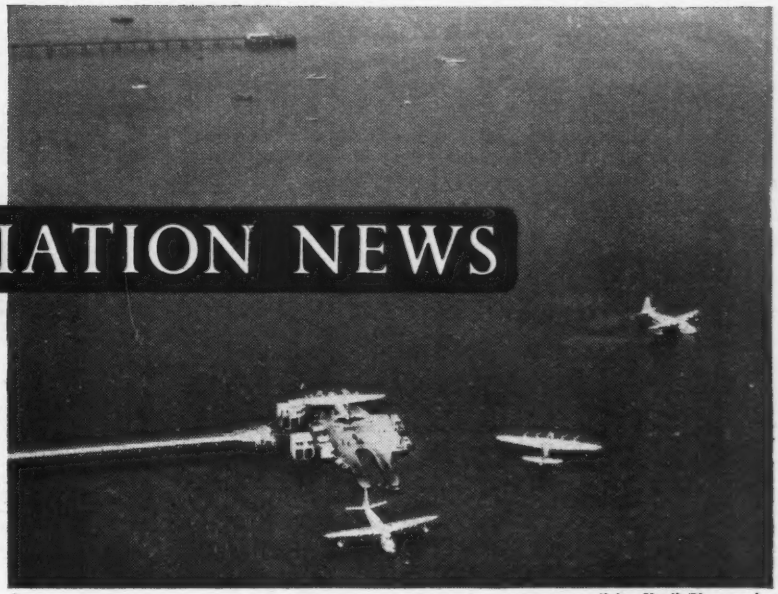
JET-BOMBER COCKPIT

SIXTY instruments and sixteen indicator lights are, it is claimed, observed with ease by the pilot of the North American B-45 Tornado four-jet bomber. An American counterpart of the English Electric Canberra, the Tornado is now in service with U.S.A.F. units. The principal flight instruments are disposed in a double row on the centre of the "console"-type panel, and to avoid a condition of distorted vision the panel is tilted 15 deg forward from the horizontal about an axis approximately mid-way between the upper and lower rows of instruments. This is said to provide a near-perfect cone of vision for the pilot, with emphasis on the flight-instrument group. The instruments required in a four-jet aircraft the size of the Tornado necessitate a panel about 50in wide, which means that those dials at the extremities of the panel would be placed further from the pilot's eyes than those at the centre. By turning the sides of the panel 15 degrees inboard towards the pilot, a focal point is achieved which places all dials at about the same viewing angle and diminishes the distance to the panel extremities. The controls for the four turbojets are to the right of the pilot's seat and the primary engine-instruments, which require more or less continuous observation, are adjacent. Engine instruments which require only periodic checking are on the left-hand side of the panel. So readily visible are the instruments that the second pilot, seated in tandem directly behind "No. 1," requires only basic flight-instruments to be duplicated at his seat. Because the vibration present is insufficient to overcome the friction inherent in certain instruments—resulting in "sticky" pointer indications on certain dials, such as those of the static pressure and electrical types—an instrument-panel vibrator is installed to ensure instantaneous indications. Conventional fluorescent lighting is provided.



How the B-45's instrument panels are raked 15 degrees in plan and side elevation to provide the optimum cone of vision.

CIVIL AVIATION NEWS



LINE MAINTENANCE: The B.O.A.C. flying boat base at Hythe. Solents have been flying from Southampton to Basra and Bahrein since the Argonauts were grounded on September 6th. The latter resumed normal services to Hong Kong and Tokyo last Monday, October 10th, and Solent services are again confined to the South and East Africa routes.

"Aerofilms" Photograph

B.O.A.C. REORGANIZATION

A NEW administrative organization for B.O.A.C. is to be introduced progressively. The plan, which was produced by Sir Miles Thomas, Chairman of the Corporation, and has been approved by the Ministry of Civil Aviation, is intended to increase efficiency. Another scheme was introduced last year placing the Corporation on a decentralized basis, but since the merger with B.S.A.A. that organization has become somewhat outdated. The new pattern will presumably be based upon the broad outline mentioned by Mr. Lindgren in the House of Commons during the second reading of the Airways Corporations Bill on June 29th. The first phase of the merger of B.O.A.C. and B.S.A.A. would be dictated, Mr. Lindgren said, by the introduction of Stratocruiser, Canadair and Hermes aircraft, and would be designed to minimize disruption. The dispersal of the then three Corporations' operational and maintenance bases would also be an influencing factor. That phase of the organization was to be followed by a modified form of "devolution on a line basis, of responsibility to lines which are responsible for providing aircraft and crews, and to areas, which, both at home and abroad are responsible for the commercial exploitation of the services." Mr. Lindgren said that the overall direction from the centre at headquarters level would be simplified, and the present geographical executive form of organization both in B.O.A.C. and B.S.A.A. would disappear. We presume, therefore, that for operational purposes each type of aircraft will comprise one Line, whereas the sales and purely commercial organization will be placed on a basis quite independent of the Lines.

K.L.M. CELEBRATION

ON Friday, October 7th, K.L.M. celebrated the 30th anniversary of its formation. It was in 1919 that Dr. Albert Plesman (now President of K.L.M.) organized the first air exhibition at Amsterdam, and two months later formed K.L.M. and became its first administrator. The first service between Amsterdam and London was flown on May 17th, 1920, in a de Haviland D.H.-16 chartered from Aircraft Travel and Transport (Airco), Ltd. That company's ground superintendent, Capt. Spry Leverton, was responsible for dispatching the aircraft from Croydon on that occasion, and he is, of course, now K.L.M.'s Regional Director for the U.K. The pilot on that first flight, Mr. H. "Jerry" Shaw, now of Shell Aviation, London, and Mr. Harold B. Rhodes, one of two passengers, took part in a recent celebration in Amsterdam.

The London service was followed by the opening of new routes to Hamburg and Copenhagen, and at the end of the first operational year 345 passengers had travelled by K.L.M. Regular services to Batavia were opened in 1929, and in 1934 K.L.M. flew a commercial service from Amsterdam to Curaçao in a Fokker F-18 "Snipe" to inaugurate the company's West Indies network. In 1934 a K.L.M. DC-3 won the handicap section of the Mildenhall-Melbourne air race. Since the war Dr. Plesman has worked untiringly towards recovery, and it is significant that last year K.L.M. carried more than three times the volume of traffic carried in 1939. The fleet now consists or 108 aircraft which fly along 75,000 miles of unduplicated air routes.

ACCIDENT INVESTIGATION

THE Minister of Civil Aviation has ordered a Public Court Investigation to be held in London on November 28th into the cause and circumstances of the accident which occurred on August 19th at Greenfield, Yorks., to the B.E.A. Dakota G-AHCY. The President of the Investigation will be Commander N. A. J. Cohen, R.N., Barrister-at-Law. As reported in *Flight*, August 25th, the aircraft was on a flight from Belfast to Manchester, carrying 29 passengers. After passing over Ringway in conditions of poor visibility, the Dakota hit the ground near the summit of a hill approximately 1,300ft in height, some eight miles from the airport.

SURVEYING FOR OIL

THE first of two expeditions being sent out of this country by Hunting Aerosurveys Ltd., to assist the Anglo-Iranian Oil Co., left Bovingdon recently for Southern Iran. Air survey mosaics and maps are to be prepared for the geologists to locate new oil producing areas. The photographs, many of which will be of mountainous areas, will be taken from the company's specially equipped Bristol survey Freighter, mostly from heights above 20,000ft. A second survey expedition to Iran will follow. The Freighter recently delivered a helicopter to the Sudan, to be used for pest spraying work.

FURTHER THOUGHTS ON DEVALUATION

THE new threat which sterling devaluation has made to American sales of transport aircraft is the subject of an article in the *New York Herald Tribune* by Raymond T. Hoadley. American manufacturers, he says, are not beyond the design-study stage in civil jet aircraft and it will take from five to eight years to produce a fully tested jet-propelled civil transport ready for airline operation. Great Britain is not only beginning to fly such types but will be able to market them at a more attractive price than American manufacturers could afford, owing to currency devaluation together with such important factors as lower labour costs "and Government subsidization in the development of new planes." Some leaders of the American industry, the writer avers, are afraid that if their own Government subsidized prototypes it might be the first step towards nationalization.

He suggests that the American industry has become complacent through having received large orders for military aircraft. In some Government circles in Washington, he says, the view is held that it would be just as well if the British did obtain leadership in transport aircraft development for a time, for such leadership would act as a "morale rebuilder for the British Empire."

There has been some pressure recently for legislation to authorize a Government-financed commercial transport proto-

CIVIL AVIATION NEWS . . .

type programme in the U.S., continues the article, but it is thought unlikely that such a Bill will be passed this session.

These views are interesting indeed, and reflect once again the American reaction to the revelations at Farnborough. We might permit ourselves one slight regret—that, as a result of devaluation, we shall, perhaps, receive fewer dollars in the end. Since our civil jets are so far ahead in design, foreign airlines may feel compelled to operate them; in other words, the demand will in any case exist without the added incentive of lower dollar cost.

BIG AIRCRAFT, LITTLE FILM

AT a reception at the Odeon Cinema, London, last Thursday, Mr. G. Strauss, Minister of Supply, presented a copy of a film to the Bristol Aeroplane Company. The occasion was the premiere of the same film, which, dealing with the development of the Brabazon, is aptly named "The Flying Skyscraper," and is to be shown at some 3,000 cinemas throughout the country.

In receiving the copy on behalf of the company, Mr. A. J. Pegg, chief test pilot, referred to the two phases in the development of the prototype—first the construction, which had just finished, and secondly, his own, the flight development, which was now in its very early stages.

This absorbing film, which has been prepared by the Crown Film Unit for the Central Office of Information, tells the story of the Brabazon from the drawing-board to its first flight—and tells it well in a matter of ten minutes.

BRISTOL LOOKS AHEAD

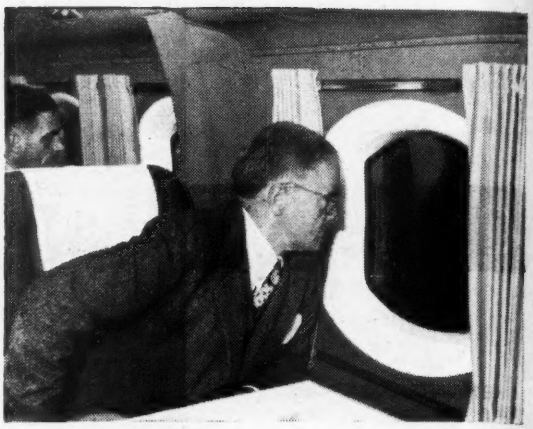
INDICATIVE of increasing public recognition of the helicopter's potentialities in air transport is the attitude of the Bristol Chamber of Commerce, which, in its journal, advocates the provision of a helicopter park to serve Gloucester, Cheltenham, Bath and South Wales. It is suggested that use might be made of the existing airport at Whitchurch, and that the helicopters might eventually "feed" services to Ireland, Scotland, North-east England and the Continent at a main-line airport such as Filton or Lulsgate Bottom.

AIR FRANCE WINTER SERVICES

ALTHOUGH final details of Air France's winter programme will not be settled until later this month, its main features will include the continuation of the direct London-Riviera service with a minimum frequency of two services each week, increasing to four later in the season. On the London-Paris route summer schedules will continue to operate until the end of this month, after which there will be five return services each day, operated alternately with Languedocs and DC-4s. The Manchester-Birmingham-Paris service will fly three times each week, with connections in Paris to the Riviera.

Six flights each week will be operated from London *via* Paris to Geneva and Zurich, and special winter-sports excursion rates, with the right to break the journey in Paris, will be offered. Services to Spain and Italy will be maintained at an average of twice a week, stopping at Madrid, Barcelona, Majorca, Lisbon, Rome, Milan, Padua and Trieste. As reported in *Flight* of October 6th, DC-4s are replacing Languedocs on most of the services to North Africa, in order to increase capacity.

CONDEMNED AREA: Whilst on a recent visit to Northern Rhodesia, Sir Miles Thomas examined the runway at Livingstone Airport, part of the surface of which will require re-laying to overcome blistering of the bitumen by the hot sun. In this photograph are Mr. Hedley Priest, director of the Colonial Development Corporation, Mr. Smith, engineer in charge of airport construction, and Mr. Vernon of Spillers Ltd., the flour millers, who expect to do considerable business in the area served by the airport.



IN POLITE PITCH: During a brief visit to this country, Mr. Ralph Damon, president of Trans-World Airlines, made a flight in the prototype Ambassador. On the occasion of his trip Airspeeds used an interesting new passenger-comfort technique—reversal of port-airscrew pitch in order to permit draughtless emplaning.

B.O.A.C.'s FIRST STRATOCRUISER

THE pilot of the first Boeing Stratocruiser to be flown from the United States for delivery to B.O.A.C. (and expected this week-end) will be Capt. W. S. May, a Canadian who joined Imperial Airways in 1936, and who was one of the original pilots engaged on the North Atlantic route in 1941. Capt. May was recently appointed Chief Flying Instructor in charge of the Stratocruiser crew-training programme at B.O.A.C.'s new Atlantic base at Filton, Bristol.

Incidentally, residents of Chipping Sodbury, who recently complained of the noise of night-flying from Filton, have been assured that flying will be conducted so as to cause as little inconvenience to the public as possible, but they have been asked to bear in mind the fact that a certain amount of night-flying training on the Stratocruisers will be unavoidable.

SABENA BUYS MORE DC-6s

WITH the object of increasing frequency throughout its services, Sabena has ordered two new DC-6s, so bringing its total fleet to 61 aircraft. At present the fleet comprises three DC-6s, seven DC-4s, six Convair 240s, 17 DC-3s, one C-54, seven C-47s, six Doves and 12 of other types. DC-4s operate three services a week between Brussels and the Belgian Congo and the company hopes that by so increasing the DC-6 fleet, it will be possible to operate two of these flights with that type. The additional aircraft will also enable a daily service across the North Atlantic to be maintained: during the coming winter the route will be operated at the same frequency as during the summer period, i.e., with three flights a week in each direction.

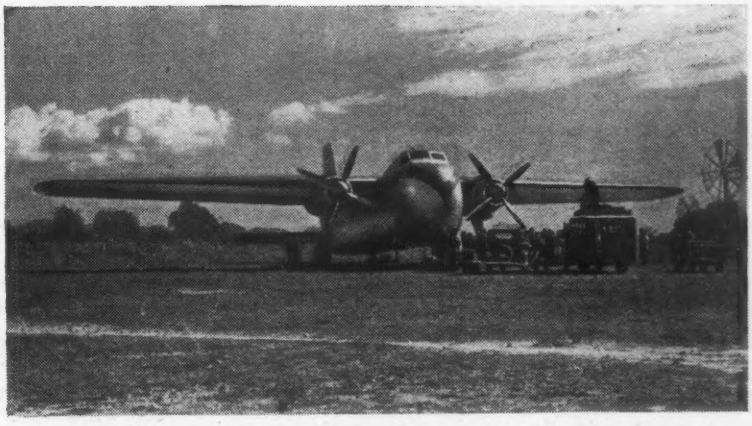
Other changes in the winter time-table which became effective on October 2nd include close co-operation with other European airlines in the arrangement of schedules, in an effort to increase load factors and eliminate duplication on certain routes. Services to Milan, Zurich, Prague, Copenhagen and Stockholm will be flown daily; to Madrid and Lisbon twice weekly, and to Oslo and Christiansund three times a week. Twenty-six flights to London and 21 to Paris will be made from Brussels every week, and the thrice-weekly services to Rome, Geneva and Nice are being maintained.

It is reported that the company has lost about £135,000 in the financial year 1948.

TOURIST RECORD IN 1949

IN a report on the 1949 tourist season, the Travel Association states that during the first eight months of the year approximately 400,000 tourists from all parts of the world visited Britain, and by the end of the year it is expected that the figure will have risen to 560,000. It is estimated that one-quarter travelled by air. Traffic from North America was equal to that of the best pre-war year, and was 30 per cent greater than in 1948. Up to the end of August, 75,023 American tourists visited Britain and more than 21,000, in transit for other countries, stayed for short periods. The Association estimates that by the end of the year more than 135,000 visitors will have come from the United States, including persons in transit, whilst visitors from Canada are expected to number between 30,000 and 35,000. Earnings from the U.S., including fare payments can be provisionally estimated at $70 million.

The number of visitors from the Continent has shown little increase, but it is thought that improvements in long-distance transport have brought more tourists from countries outside Europe. Such traffic this year has been more than ten per cent greater than in the corresponding best pre-war period, and it is expected that the expansion in the last two years will continue in 1950, when it is estimated that 600,000 visitors will come to Britain. Of this number, 175,000 are expected from North America, in addition to 30,000 or more Americans in transit to other countries. The target for the tourist trade in 1950 is £65 million, including fare payments to British carriers on international routes. Dollar earnings are expected to amount to about 100 million.



ISLAND OPERATION: Unloading a Bristol Wayfarer in the Balearic Islands. The Spanish charter company Aviacion y Comercio is flying weekly services between Barcelona and Ibiza (in the Islands) with 32-seater Bristol Wayfarers.

LANCASTER ACCIDENT REPORT

THE Chief Inspector of Accidents has submitted his report on the cause of the accident to Lancaster III G-AHJW, which flew into trees on high ground at Conholt Park, near Tarrant Rushton, on November 22nd, 1948. The aircraft was totally destroyed and seven of the occupants were killed, the sole survivor being the radio-officer, who was severely burnt. The pilot was Captain R. M. W. Heath, D.F.C., aged 25, and the aircraft, which belonged to Flight Refuelling, Ltd., was on a flight from Wunstorf, Germany, to the Company's base at Tarrant Rushton, Dorset. Captain Heath, an ex-Transport Command pilot, had some 2,350 hours' flying experience.

The aircraft took off from Wunstorf at 1456 hr, and at 1658 hr established contact with Hurn Approach Control, the pilot reporting that he was at 2,000 ft and descending below cloud. At 1708 hr, in conditions of bad visibility, the aircraft flew into trees on ground 760 ft above sea level. No evidence of pre-crash failure was found, and all the pre-flight safety requirements had been complied with. The aircraft had evidently been making good a track 24 miles north of the desired one and, since visual fixes were impossible, it was assumed that the navigator used a navigational aid to check his track and position before let-down.

The Chief Inspector concludes that the most likely cause of the aircraft's divergence from its desired track was that an error had been made in the selection of a Eureka responder beacon, and that the aircraft was being homed on Netheravon instead of Tarrant Rushton, where the pilot had been told to expect clear weather conditions.

BREVITIES

WORK on the extension of Chileka Airport, the main airfield in Nyasaland, has been delayed for some two months by mechanical breakdowns of the earth-moving equipment.

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Fares on the Qantas Empire Airways' services to New Guinea and the islands North of Australia have been increased by 10 per cent, due to the rapidly rising costs of operation.

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Capt. David A. Brice has resigned from his appointment in Skyways, Ltd., to rejoin B.O.A.C. Previously he served for two years with the R.A.F. and flew with B.O.A.C. from 1941 to 1946 when he was made chief pilot of B.S.A.A. He joined Skyways in 1947.

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A.O.A. Stratocruiser services between New York and London are to be extended to Frankfurt from November 1st. The new service will be operated four times a week, and sleeper berths will be available.

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After October 24th, all enquiries concerning M.C.A. *Information Circulars* should be addressed to the Ministry of Civil Aviation (Est. 7a), Ariel House, Theobalds Road, London, W.C.1. This address is that of the new M.C.A. building, which has inherited the name of the old premises in the Strand.

* * *

A branch of the Air Registration Board is to be set up in Karachi, to assist the Pakistan Government in establishing an Airworthiness Department of its Directorate of Civil Aviation; it will also conduct the Board's normal activities in respect of British registered aircraft and personnel operating in that area. Mr. A. E. Clifford, an A.R.B. Senior Surveyor, assisted by Mr. H. B. Cundall, will be responsible for opening the new office.

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It is reported from Australia that the Australian National Airlines Commission is considering the introduction of tourist fares on routes operated by Trans-Australian Airlines, the nationalized company. This would involve the adaptation of DC-3s to carry 28 passengers instead of the usual 21.

* * *

M.C.A. *Information Circular No. 122* states that Article 32 of the Air Navigation Order, 1949, referring to "gliding by young persons," has been slightly amended. Normally, no-one under the age of 16 is allowed to have control of a glider in motion at a distance of more than three miles from a certified point. The amendment relaxes this condition when the flight is made in accordance with arrangements for the supervision of the pilot by the gliding club of which he is a member.

* * *

The Air Registration Board announces the third issue of *Sub Section A.30 of British Civil Airworthiness Requirements* to replace Issue No. 2. This sub-section deals with the procedure for approving welders engaged in the welding of parts essential to the airworthiness of any aircraft effected by the Requirements, and where the process is such that the making of a sound weld depends largely upon the competence of the welder. The Board reserves the right to select samples of an approved welder's work at any time for examination purposes.

* * *

Following the return of Mr. G. R. Scott-Farnie (operations manager) from an extensive air tour of the British Caribbean area, International Aeradio, Ltd., announce that a company

CIVIL AVIATION NEWS . . .

will probably be set up in that region. It is understood that the local governments agreed that considerable economy and increased overall efficiency might be achieved by using the I.A.L. organization for setting up co-ordinated control of radio facilities on an area basis on behalf of the operating airlines. Accompanied by W/C Eggesfield, Director General of Civil Aviation in the West Indies, Mr. Scott-Farnie visited Barbados, British Guiana, Trinidad, Jamaica, St. Lucia, Grenada, Antigua and St. Kitts.

* * *

The Ministry of Civil Aviation announces that Mr. C. J. Lewis, formerly Civil Air Attaché in the Middle East, has been appointed to the new post of Civil Air Attaché, Central American and Caribbean Republics with headquarters in Jamaica. Mr. R. M. S. Rayner, hitherto Assistant Civil Air Attaché is to succeed Mr. Lewis in the Cairo post.

* * *

In response to the continued demand for the Silver City Airways car ferry service which operates between Lympne and Le Touquet, the Company has decided to maintain the service throughout the winter. Already, a considerable number of booking applications has been made for as far ahead as August, 1950, and many reservations have been made for the Christmas period.

* * *

B.E.A. has introduced fare reductions of up to 30 per cent for serving members of the Forces and their families travelling between London and Berlin, Malta, Athens, Dusseldorf, Frankfurt, Gibraltar, Hamburg, Munich and Vienna. The concession is granted to wives and dependent children, who need not necessarily be travelling with the men. The journey must be a direct one, no break at any intermediate point being allowed, while bookings may not be made more than seven days ahead and fares must be paid by the passenger and not by a Service warrant.

* * *

Under a reciprocal air agreement signed on September 27th in Rangoon between the United States and Burma, the U.S. Government may designate a carrier to operate scheduled services to and through Burma. Services from Burma to America, in the event of a Burmese international airline being inaugurated, are also authorized. The agreement, which closely follows the standard I.C.A.O. document, is the 41st bilateral agreement concluded by the U.S. and the first by Burma. At present both P.A.W.A. and T.W.A. are certified to operate scheduled services between the U.S. and Burma.

* * *

The British Aviation Insurance Co. announce the formation of a separate Air Safety Division, intended primarily to afford advice to underwriters and at the same time to offer a technical consultant service on such matters as accident investigation, repairs recommendations and estimates, safety standards, salvage disposal and claim negotiations, regardless of whether the enquiry directly concerns insurance. A permanent staff is available to deal with any problem connected with air transport which may be encountered by insurance brokers, operators, manufacturers or others. The new division will operate under the personal direction of Capt. A. G. Lamplugh.

FROM the CLUBS

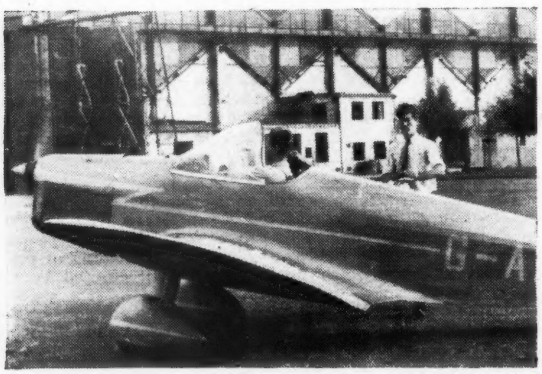
THE Royal Aero Club of New South Wales is now organizing its annual pageant, which will be held at Bankstown Airport on November 29th. Final details have yet to be announced, but it is hoped that the R.A.A.F. will permit its jet aircraft to take part.

* * *

WHILE on three months' leave in this country, Mr. H. C. N. M. Oulton, a district commissioner in the Sudan, joined the Royal Naval Flying Club. A holder of a Personal Pilots' Licence, he frequently flew the club's Tipsy, and liked it so much that he purchased one for his own use and recently flew himself back to the Sudan in it. A photograph taken on his departure from Gosport appears at the foot of this column.

* * *

ON September 25th, 14 members of the Weston Aero Club at Weston-super-Mare competed in the annual spot-landing contest for a cup presented by the president, Mr. G. M. D. Bennett. The "target" on this occasion was a strip of white canvas measuring 5yd × 2ft, across which the competitors had to land on three points with full flap, and with a six-knot wind on the beam. Mr. I. Ball and Mr. K. Cooke tied for first place in an eliminating heat; the cup, which was eventually won by Mr. Ball after a fly-off, will be presented at the annual ball to be held on November 4th at the Winter Gardens, Weston-super-Mare. A programme of competitions for the winter and next summer is being organized, and the club intends to invite members of other clubs to compete.



ACQUISITION: Mr. H. C. N. M. Oulton in the Tipsy in which, as related above, he has returned to his duties in the Sudan. He is a member of the R.N. Flying Club.

* * *

A SERIES of competitions organized by the West London Aero Club concluded on Saturday, September 24th, with a precautionary landing competition; it was won by Major Lambton with Miss Sheila Van Damm and Mr. J. Williamson second and third respectively. In the evening a supper dance was held, during which a number of cups were presented by Mrs. Hofer. The Windmill Challenge Cup, awarded to the competitor gaining the highest number of points in competitions throughout the summer, was won by Mr. David Ewart of the Fairey Flying Club, with Miss Sheila Van Damm as the runner-up and Mr. Toms of the Fairey Club third. A number of other cups and prizes were donated by Messrs. J. J. Hofer, A. C. Kingham, A. L. B. Dawson and the Fairey Fying Club.

ULTRA-LIGHT ACTIVITY

THE Ultra Light Aircraft Association held a very successful week-end rally at Skegness last month in perfect weather conditions. Arrivals included G/C. E. L. Mole in the little Typsy Belfair, which was later judged to be the best-looking aircraft in the rally, and Mr. Peter Masefield, president of the Association, who came in his Gemini. The incredible slow-flying characteristics of the little German-designed Zaunkoenig and a demonstration of the Slingsby Motor Tutor were features of the Sunday's flying programme, which also included spot-landing and bombing competitions, and jumps by members of the Apex group of parachutists.

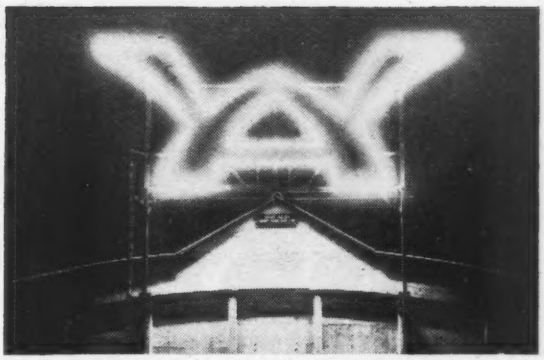
The Slingsby Motor Tutor, incidentally, has recently completed its flight trials and is now awaiting issue of a C. of A. Several R.A.E. pilots who flew it at Farnborough were particularly impressed by its stall characteristics, reputed to be nothing more vicious than a gentle sink at 20 knots I.A.S.

Another rally, organized by the South Hants U.L.A.C., had been held at Somersford airfield the previous week-end. Eight visiting aircraft arrived, of which Mr. Ron Clear's rebuilt Comper Swift proved the centre of attraction. Gliding demonstrations were given during the afternoon by instructors of No. 89 Gliding School, and the performance of the Zaunkoenig, flown by Mr. Peter Gooch, always a popular show-piece at ultra-light meetings, proved something of a sensation. Several club members were given the opportunity to fly this unusual aircraft during the week-end.

Largely due to the co-operation of the M.C.A. the pioneer Community Flying Club, late of Woodley, is now established at Aldermaston. The Club would welcome applications from private owners who wish to accommodate one or two small aircraft in their hangar, in order to reduce individual expenses for club members.

AIRWORK COMES of AGE

Twenty-one Years of Enterprise Founded on a Faith in Aviation's Future



IN the late nineteen-twenties, that remote age when Avro Avians and Blackburn Bluebirds might still occasionally rub wings with World War I veterans like D.H.9s, two young men were joint owners of a Gipsy I Moth. Their names were Alan Muntz and Nigel Norman. Besides sharing the Moth, they also shared an unshakable faith in the future of aviation, so much so that they were prepared to forsake the already assured positions which both of them held in the engineering profession. They started planning. If, they argued, aviation was to achieve the future they visualized, people must have better facilities for practising it. Not that they entertained any golden visions of "flying for the million"; they were already sufficiently astute business-men to recognize the rocks on which other men's treasure-ships had foundered. With the necessary financial backing, they proceeded to acquire a goodly slice of the market-garden belt that then stretched rather drearily over the hinterlands west of Hounslow, Middlesex; and presently the beetroots and broccoli began to give way to a level sweep of firm grass, and buildings to arise along its southern boundary.

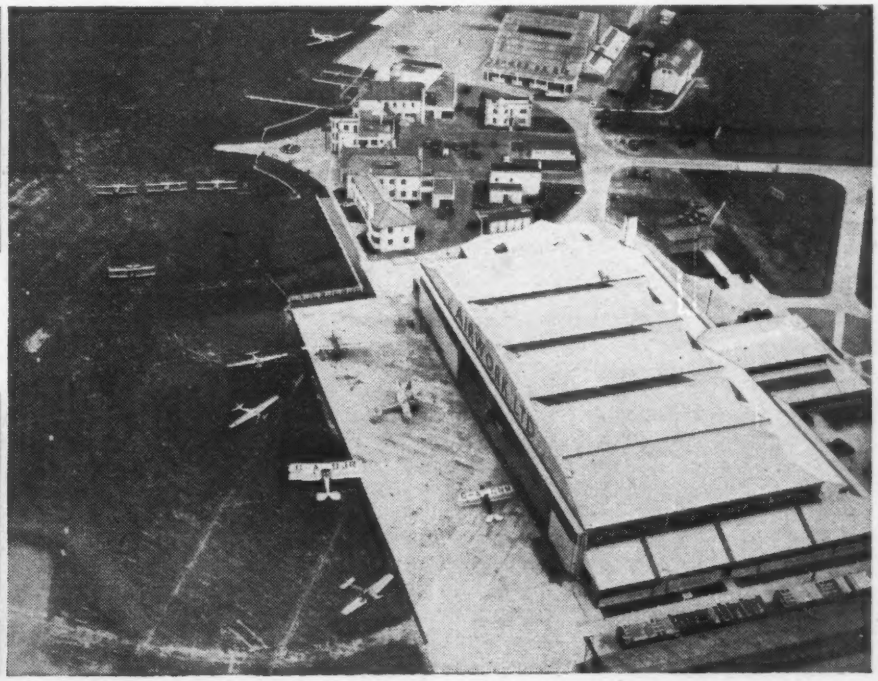
The two were, as has been said, engineers, and they had imagination. No wooden huts or glorified Nissen-huts for them; instead, there presently arose England's first all-concrete hangar. Nor were they satisfied with just plain tarmac; before the hangar they laid a vast apron of pre-cast concrete slabs, dovetailed diamondwise. Other buildings were erected: a smaller hangar divided into lock-ups for private owners; a clubhouse; a control tower. In a few months, Heston Air Park was in being.

During 1930, radio and Customs facilities were installed and, not long after, a complete airfield-lighting installation. The aim was to make Heston the gateway to the Continent for the aircraft private owner and the charter operator; and, deliberately, the layout was closely integrated to provide an ideal "municipal airport" which could be shown to provincial authorities interested in the idea of providing similar facilities in their own localities.

If the *cliché* may be forgiven, Heston soon became a "hive of activity." King's Cup Races had already been flown from it; tenants opened their own aircraft-and-accessory sales premises; the private owners' lock-ups were soon filled to capacity. By the end of 1930, nearly a hundred pupils were under instruction at the flying school. Instruction was not cheap—it cost four guineas an hour, dual or solo, high rates in those days—but it was good, and many now distinguished pilots owe their skill to the sound teaching of the instructional team led by Capt. V. H. Baker and his deputy, Brian Davy, who in 1936 succeeded him as C.F.I. The late Lord Londonderry, Air Minister at the time, became a proficient pilot at the hands of Capt. Baker after a not-too-successful first venture with a Service instructor, who had probably, and understandably, lacked the necessary candour. Unhappily, Baker was to lose his life while testing a fighter during the war.

Instruction at Heston was given, first on Moths and later on a fleet of Avro Cadets; in view of the fact that good servicing facilities for in-line engines had already been estab-

Above and below are the two founders of the firm, the late Sir Nigel Norman and Mr. Alan Muntz. On the right are the pre-war Heston buildings



Some leaders of the Airwork team to-day (left to right): G/C. T. L. E. B. Guinness (chairman), Mr. M. D. N. Wyatt (managing director), W/C. "Bats" Page (sales manager), Mr. R. W. Cantello (i/c. repairs and maintenance)—photographed above on an overseas trip—and Capt. R. H. McIntosh (chief pilot). Mr. Alan Muntz, whose portrait appears on the previous page, is the company's vice-chairman.

Airwork Comes of Age . . .

lished, it was decided to fit the Cadets with Gipsy Majors in place of the standard 135 h.p. Genet Major radial. Instruction was also given in Autogiro flying, while a Moth Major was operated for the Household Brigade Flying Club, which had taken up its abode at Heston.

When airfield lighting was installed, the letters "AW" (see heading illustration) blazed in red neon from the big hangar's roof as a beacon: Airwork, Ltd., the company formed by Muntz and Norman, was firmly established. Their title could not have been more aptly chosen. They might have called themselves (as other firms have done) something much more resounding and five times as long; but the brief, pithy name exactly summed-up their intention, which was to do everything aeronautical except actually construct aircraft.

All through the nineteen-thirties every department of the business continued to expand, and they were soon able to claim that their aircraft sales organization was turning-over more aircraft (in the strictly business sense of the term!) than any other similar organization in the world. W/C. A. D. ("Bats") Page, sales manager then as now, recalls that one big deal was the purchase, in 1937, of British Airways' D.H. fleet when they re-equipped with Lockheed Electras—Airwork acquired three D.H. 86s, six Rapides and spare engines to suit.

At one period two major airline companies—British Airways and Jersey Airways—were operating from Heston.

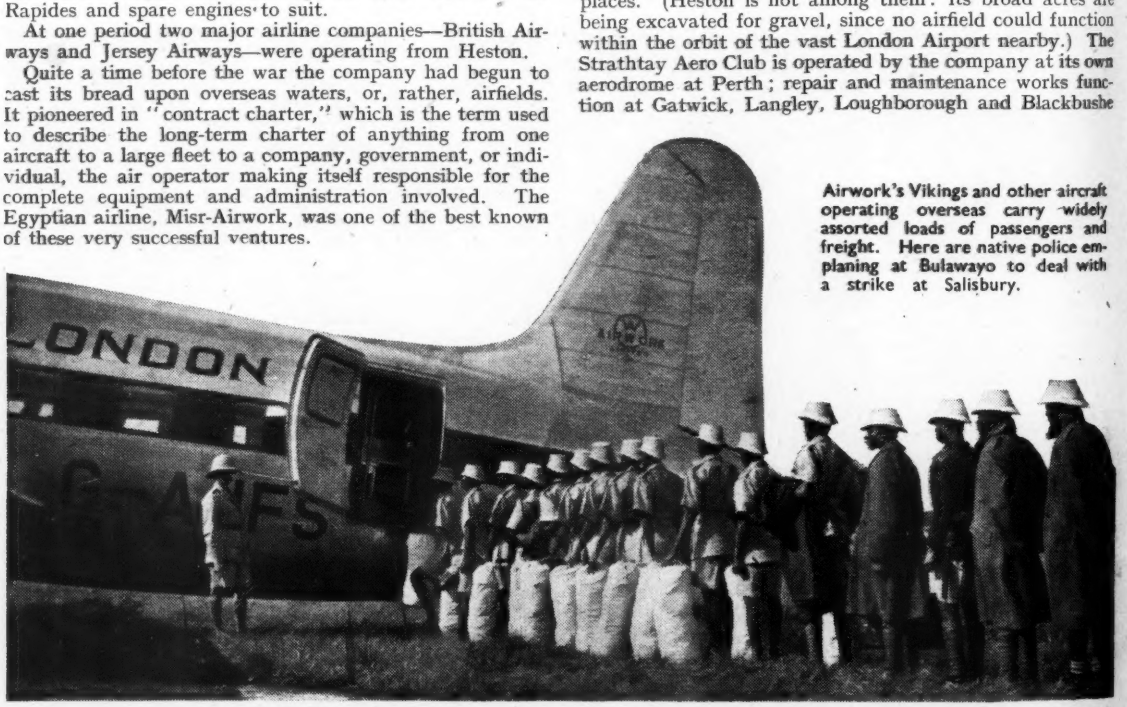
Quite a time before the war the company had begun to cast its bread upon overseas waters, or, rather, airfields. It pioneered in "contract charter," which is the term used to describe the long-term charter of anything from one aircraft to a large fleet to a company, government, or individual, the air operator making itself responsible for the complete equipment and administration involved. The Egyptian airline, Misr-Airwork, was one of the best known of these very successful ventures.

Meanwhile, the company's instructional activities were spreading beyond Heston: the first provincial school was opened at Perth, later (in 1939) to become No. 11 E.F.T.S., still under Airwork operation. Others were opened at Elmdon (Birmingham) and Booker (near High Wycombe), together with A.O.N.S.—Air-observer Navigation Schools—at Staverton, Gloucestershire, and Wigtown, in Scotland. Later came schools at Barton, Ringway, Cheltenham, Grangemouth and Usworth.

During the war the Airwork organization was able to make an immensely valuable contribution to the national effort: thousands of pilots were turned out by its flying schools and countless aircraft serviced, repaired or reconstructed. Other departments of the firm were building such varied sinews of war as Bailey bridges, assault craft and even (as commemorated by an example in the hall of the London office) those celebrated pikes for the Home Guard.

Nevertheless, the war dealt the company one heavy blow—the death of one of its two founders. Serving in the Royal Air Force, and having attained the rank of Air Commodore, Sir Nigel Norman had taken a vital part in the training of airborne troops: then, in 1943, flying to the Middle East in a Hudson, he lost his life in a crash.

To-day the Airwork home organization is based at six places. (Heston is not among them: its broad acres are being excavated for gravel, since no airfield could function within the orbit of the vast London Airport nearby.) The Strathtay Aero Club is operated by the company at its own aerodrome at Perth; repair and maintenance works function at Gatwick, Langley, Loughborough and Blackbushe



Airwork's Vikings and other aircraft operating overseas carry widely assorted loads of passengers and freight. Here are native police emplaning at Bulawayo to deal with a strike at Salisbury.

Airwork Comes of Age . . .

(where its United Kingdom charter fleet is based); and at Booker it operates the last remaining E.F.T.S. in the country—No. 21.

Even in these grim and earnest days the few remaining pleasures of the private owner are not forgotten, and at Gatwick his aircraft may receive any required service; here, too, Dakotas are, in the Service idiom, "reduced to produce," bombers converted to less lethal uses, and general servicing work conducted for airlines.

While the aircraft sales side of the business continues to flourish, the contract charter division—deliberately delayed in its revival until any and every type of aircraft and work could be dealt with—is now operating on a larger scale than ever before. Airwork runs the regular "leave service" on behalf of the Sudan Government, its Viking fleet plying between London, Marseilles, Malta, El Adem, Cairo and Wadi Halfa; and it is responsible for the operational side of Sudan Airways, with its network covering the entire Sudan territory. It operates big route-mileages for oil companies, including Anglo-Iranian at Abadan, the Shell Co. of Ecuador and Iraq Petroleum at Haifa. In a less industrial sphere, it runs a "holidays by air" charter service for the Polytechnic Touring Association, Ltd., and is acting in a similar capacity for the Ski Club of Great Britain.

Incidentally, for reasons connected with internal politics, a great deal of long-term charter work is also being carried out more or less "anonymously" for various countries. In such cases, native personnel (trained by the Company at one or other of their overseas service stations) are employed to the largest possible extent.

When—or soon after—this story began, the Airwork fleet consisted of six aircraft. To-day the number owned and/or operated by the company is approaching 100; it includes Vikings, Doves, Rapides, a Bristol Freighter, Austers, Tiger Moths and other types.

So much for machines; as for men, those who run Airwork, Ltd., to-day are led by G/C. T. L. E. B. Guinness, O.B.E. (chairman); Mr. Alan Muntz (vice-chairman, and one of the two original founders of whom we have spoken); and Mr. M. D. N. Wyatt (managing director). W/C. "Bats" Page is sales manager, and Mr. R. W. Cantello is responsible for repairs and maintenance. Mr. L. A. Lafone—apart from Mr. Muntz, probably the "oldest inhabitant" in years of service—watches the Middle East interests; and the contract charter division is controlled by Sir Archibald P. Hope. Capt. R. H. McIntosh, D.F.C., A.F.C., formerly of Imperial Airways, is chief pilot; he joined Airwork in 1938.

R. E. C.

GLOSTER'S ANNUAL DINNER

In previous years the annual dinner of the Gloster Aircraft Company has been confined chiefly to members of the drawing office staff, but this year, for the first time, the scope was widened to include the majority of the executive staff of the company. A number of important guests were also invited, including Air Marshal Sir Basil Embry, K.B.E., C.B., D.S.O., D.F.C., A.F.C., C.-in-C., Fighter Command; General Major I. A. Aler, C.-in-C. of Netherlands Air Force and Dutch Western Union representative; Maj. Van der Wolf, D.F.C., Assistant Air Attaché, Netherlands; General Major H. de Bock, Chief of Supplies, Belgian Air Force; Maj. Jan Ceuppens, D.F.C., Belgian Air Attaché; A. Cdre. J. G Elton, C.B.E., D.F.C., A.F.C.; Mr. J. E. Serby, B.A., F.R.Ae.S., Director of Military Aircraft Research and Development, M.o.S.; Mr. A. T. Hancock, Assistant Director of Aircraft Supplies; Mr. G. Dowty, F.R.Ae.S., Chairman and Managing Director, Dowty Equipment, Ltd. There is little doubt that this seventh annual dinner held at the Plough Hotel on October 7th was regarded as the most successful to date.

Mr. R. W. Walker, F.R.Ae.S., toasted "the firm." He recalled that Gloster's important contribution in wartime had been chiefly concerned with the building of other people's aircraft. Now the company, and others abroad, were building Gloster fighters. Excellence of design in the first place would maintain this position. Mr. P. G. Crabbe, A.F.R.Ae.S., the managing director, in his reply, said that the company had orders for Meteors from five foreign companies, and others were in the queue, but Meteors were "on points." In the current year production would reach a new high level, but one had to remember that it meant one year less of the ubiquitous Meteor. The new product must be ready in time, and it meant an extra effort by all on behalf of to-morrow's breadwinner. He was glad to say that the Bentham design office was now to return to the fold at Brockworth, the necessary extensions having been sanctioned.

Speaking for Mr. H. Burroughes, F.R.Ae.S., who was absent in America, Mr. Eric Greenwood, O.B.E., proposed "the guests." He thought it was most important to pay the greatest possible attention to the advice given by "the practical fellows." Mr. George Dowty, recalling that he had been with the Gloster company twenty years ago, said that although he replied for the guests, he did not feel like one. He congratulated the company, especially the design staff, for the excellence of their products in recent years.

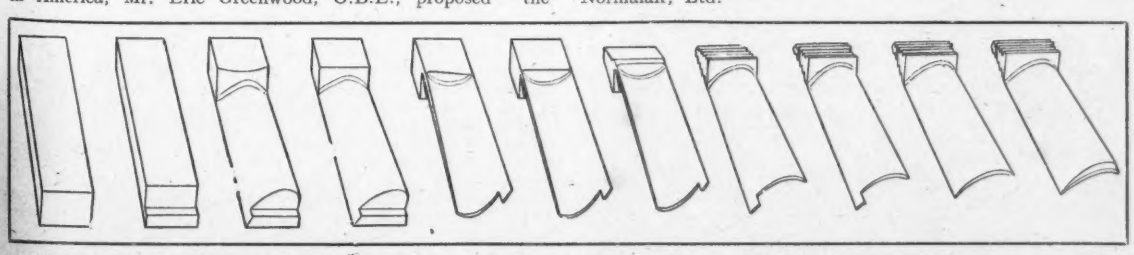
Sir Basil Embry was grateful for the opportunity of looking over the Gloster factory during the afternoon. He said that Farnborough showed we were not short of ideas, engineers, designers or technical skill. It was probably the greatest triumph in the history of British aviation, but, he asked, where was it leading? Perhaps we were becoming too specialized in types and roles, and the fighting service might lose its flexibility. There must be a degree of specialization, but he wished to sound a warning that it might be overdone. He then asked all present to drink to "the year behind us."

Mr. W. G. Carter, proposing "the year before us," indicated that much of what he would like to say had to remain unsaid for security reasons. He read a letter from a group of American technicians received following their visits to the company, one paragraph of which stated that the time spent with Glosters had been an opportunity and experience outstanding during their tour of the industry.

WESTLAND BOARD CHANGES

MR. JOHN FEARN, M.I.Mech.E., A.F.R.Ae.S., has decided to relinquish his appointment as managing director of Westland Aircraft, Ltd., as from March 31st, 1950. The present deputy managing director, Mr. E. C. Wheeldon, M.I.P.E., will then be appointed in his place.

Although he will no longer be the managing director, Mr. Fearn will retain his seat on the board of the company and its subsidiaries, together with the executive chairmanship of Normalair, Ltd.



PUTTING THE "MACH" IN MACHINING: As a conception the gas-turbine has an attractive simplicity, but in the manufacture of its components many difficult problems are encountered. This illustration of the machining stages through which a Bristol gas-turbine blade passes gives some idea of the work entailed. A detailed review of the processes employed in the Bristol works (where extensive use is made of grinding, only the concave form being milled throughout), is published in the October and November issues of our associated journal, *Aircraft Production*.

SAFE OUTLOOK

Current Developments by Triplex in Glass and Perspex for Aircraft

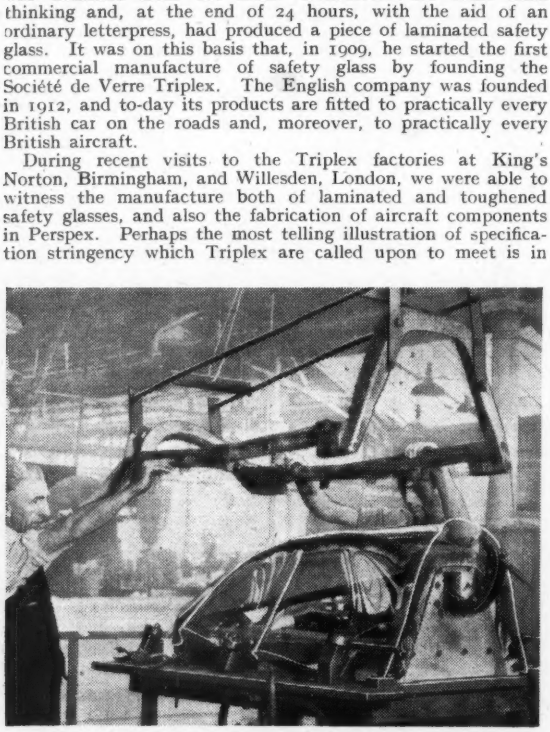
EVER since the days when Hollywood introduced the niceties of gangster technique to a wider public, "bullet-proof glass" has ceased to be something that savours of a paradox in terms. Nevertheless, the business of making safety glass is technically a complex matter—not, perhaps, in terms of what is done so much as how it is done.

Although glass is a substance with which all civilized peoples are unthinkingly familiar, it is, nevertheless, a remarkably curious material. For example, unlike metals, it is non-crystalline and is virtually structureless; it shows no sharp change in physical properties when heated or cooled and does not even have a sharp melting point, but simply begins to flow under its own weight at about 600 deg C. Most materials yield continuously when loaded beyond their elastic limit, but glass has no elastic limit and remains unchanged right up to the actual moment of fracture. It may be broken by loading in the usual variety of ways—by impact, tension, twist, compression, shear and so forth—but there is seemingly no connection between the numerical values of breaking strength. The general assumption is that glass always breaks in tension and that, no matter what the type of loading, fracture will occur only when deformation has produced the necessary tensile stress at some point in the specimen.

Of the two most usual types of safety glass in use to-day, toughened glass is based on the principle discovered three centuries ago by Prince Rupert, Duke of Bavaria and a nephew of Charles I. A great military commander, and yet more than ordinarily interested in the sciences and the arts, Rupert found that, when molten glass was poured into cold water, it formed pear-shaped droplets of immense strength—"Prince Rupert's Drops." The other form of safety glass—laminated—owes its invention to an accident. Edouard Benedictus, a French chemist, accidentally knocked a flask from a shelf. The flask had contained a collodian solution, which had dried with so great an adhesive strength that no piece of glass was detached from the flask. Benedictus did some hard thinking and, at the end of 24 hours, with the aid of an ordinary letterpress, had produced a piece of laminated safety glass. It was on this basis that, in 1909, he started the first commercial manufacture of safety glass by founding the Société de Verre Triplex. The English company was founded in 1912, and to-day its products are fitted to practically every British car on the roads and, moreover, to practically every British aircraft.

During recent visits to the Triplex factories at King's Norton, Birmingham, and Willesden, London, we were able to witness the manufacture both of laminated and toughened safety glasses, and also the fabrication of aircraft components in Perspex. Perhaps the most telling illustration of specification stringency which Triplex are called upon to meet is in connection with front screens for modern fighter aircraft. In the first place, the screen must possess optical qualities of a very high standard in order to permit use of a reflector gunsight, and, additionally in this connection, the percentage of light transmission must also be high (the specification calls for 78 per cent, and the Company provides 81 per cent). These qualities in themselves would not occasion any great difficulty of provision, but when they must be allied to the ability to withstand the impact of a 20 mm. cannon shell at a range of 200 yd the matter does become somewhat more complex. In point of fact, it devolves on the physical properties of the material used as an interlayer in the laminæ.

Edge-grinding a bullet-proof screen for a fighter: a tricky job, in that the weight may be as much as 60 lb.



The heated sheet of Perspex is draped over the form tool for edge-clamping.

Superior Synthetic

The first forms of laminated safety glass employed celluloid as an interlayer, but, as this had the disadvantage that it readily turned brown and became brittle and blistered, it was supplanted by cellulose acetate. It was, however, still necessary to seal the edges of the glass with pitch to prevent the ingress of moisture and to retain within the sandwich the slightly volatile assembly liquid. Then research into the field of synthetic materials resulted in the discovery of polyvinyl butyral, a synthetic resin which, with a tensile strength of about 3,000 lb/sq in, can be stretched approximately 400 per cent before breaking. This material, which is known as Vinal, as well as adhering to glass by heat and pressure alone and needing no edge-sealing, also gives to the interlayer a toughness and shock-resistant quality never before achieved. The process of using Vinal interlayers developed in this country by the Triplex Safety Glass Co. is claimed to yield the safest safety glass ever made.

In its natural sheet form, Vinal is a flexible, creamy-white opaque material. After having been cut to size, the interlayer is placed between the glass components and preliminary adhesion obtained by heating the loose sandwich and passing it between rubber-covered rollers. This process, as well as forming the sandwich as such, also reduces the opacity of the interlayer, but, in order completely to clarify the Vinal, it is necessary for the sandwich to be subjected to a pressure of at least 100 lb/sq in and a temperature of at least 110 deg C for a period of at least 15 minutes. The whole process, which is performed in an autoclave, takes approximately an hour and three-quarters (for the heating and cooling must be relatively gradual) and on emergence the sandwich has every appearance of a solid homogeneous structure, although naturally, the laminæ are visible at the edges.

In order to stop a 20 mm shell from 200 yd a seven-ply

In a room carefully controlled for temperature and humidity, the marriage of glass and interlayer is first made.

sandwich is required, made up from two $\frac{3}{16}$in, three $\frac{1}{4}$in and two $\frac{3}{16}$in panels of glass separated with six 0.020in layers of Vinal. Flight at great altitudes complicates the problem by introducing the nuisance of misting. To mitigate this the latest fighter screens are being fitted with an additional three $\frac{1}{8}$in rim layers and a $\frac{1}{4}$in panel on the cabin side of the screen, so providing a $\frac{3}{8}$in cavity in the bottom of which is fitted a desiccant pack of activated alumina. Even so, at the extremely high rates of descent of which modern fighters are capable, and despite the desiccant, it is possible for misting to occur inside the cavity, and the latest ideas in circumventing the trouble envisage the introduction of electrical wire elements, taking about 40 watts, in order to warm the air in the cavity.

The modern variation of Prince Rupert's discovery is to employ air instead of water as the quenching medium. The plate of glass to be toughened is first heated to its softening point and the surface is then suddenly cooled by the blast from a number of jets of compressed air. This chills and hardens the outer surfaces of the glass while the inside is still hot and still contracting; by continued surface chilling, the rigid outer skin is lightly contracted and thus put into compression. As already mentioned, glass usually fails in tension and, therefore, if a sheet of glass has a strong and uniform compressive strain in its surfaces, this must be overcome before tension can be induced. The effectiveness of this process is shown by the fact that a piece of glass so treated has its apparent ultimate tensile strength increased from about 6,000 to over 30,000 lb/sq in.

When toughened glass ultimately breaks the stress is released and the whole panel disintegrates into small particles incapable of inflicting serious injury. In view of the effects of high air speeds it is owing to this quality of disintegration on fracture, even though fracture is difficult to bring about, that toughened glass has not been found suitable for aircraft use. The defect can, however, be overcome by laminating a piece of plain glass on to a piece of toughened glass, a combination which, in fact, was widely used for bomb aimers' windows during the war. Such a combination brings together many of the most desirable properties both of laminated and toughened glass, but it also introduces the drawback that, if the toughened glass becomes fractured, the fragments are firmly held *in situ* by the laminated interlayer and vision through the glass may well be almost totally obscured.

Strength and Fragmentation

Research work is now in progress to produce a glass which, whilst retaining the essential qualities of toughened glass, breaks with a much larger fragment-size. To be known as strengthened glass, the new development is intended to be used as one of the laminæ in a sandwich panel, the idea being that, on fracture, the particles of strengthened glass will be so large that the resulting cracks will offer little or no impediment to vision. Larger fragment-size is, of course, only obtainable at the expense of strength; it is, nevertheless, thought that strengthened glass will have at least two-thirds the ultimate tensile strength of fully toughened glass.

For use in pressurized aircraft, if there is no objection to the employment of toughened or strengthened glass, the thickness of a panel required safely to withstand a given pressure may be much reduced. When such heat-treated glasses are used, however, it is particularly desirable that they should not be used alone, but as one component of a laminated glass. In such circumstances, if the heat-treated glass fractures and disintegrates, the fragments are held together by the interlayer, and the panel remains in position. This is of particular value in that cabin pressure will be retained, for it is not difficult to employ a thickness of interlayer which will withstand any (reasonable) desired pressure.

Some indication of the properties of Vinal in this connection are given by tests which have been made on glass panels designed for resistance to bird impact. The type and thickness of glass used has been found to have relatively little effect, the resistance to impact lying entirely in the thickness of the interlayer. Experiment has shown that a Vinal interlayer of $\frac{3}{8}$in thickness will give protection against a 14-lb bird at an impact-speed of 200 m.p.h. In order to keep the weight of the screen down to a minimum, the thick interlayer is faced with two relatively thin (about $\frac{1}{8}$in) panels of glass, preferably of strengthened type. On impact, the glass shatters and the interlayer bulges into a sac, which retains the carcase of the bird.

To be effective, it is patent that the interlayer must be anchored separately, and a method (known as Triflex) has been developed in which an extra thick interlayer, if necessary reinforced with metal, projects beyond the edge of the glass and is drilled for bolting direct to the screen or window frame. A refinement of the system embraces an additional single panel of toughened glass placed in front of the laminated panel with a $\frac{1}{4}$in gap between for the de-icing or de-misting circulation of hot air.

To complement their work in the safety-glass field, Triplex also fabricate a great deal of the Perspex which is used in British aircraft. The material is, of course, an I.C.I. product and is supplied to Triplex in sheet form; the Company then manipulates it to the required shapes for cabin windows, astrodomes, "bubble" hoods, radar scanner caps, glazing panels for gun turrets, and so forth.

When heated to between 90 and 100 deg C, Perspex is deformable and, if the temperature is increased to 130-140 deg C, becomes soft and rubbery. In this condition, it is readily conformable to any required shape and, as it cools, hardens or "sets" in that shape. Essentially, a simple matter; but, as so often is the case, the simple matter becomes complicated. In this instance, the difficulty is that Perspex cools, and therefore sets, rather rapidly. As a consequence, the interval between taking the hot plastic sheet from the oven and clamping it on the form tool must be as short as possible. For relatively thick sheets, the total time from oven extraction to completion of the forming operation may be as long as a minute; but with very thin sheets, it is as little as ten seconds.

For this reason the design of the edge-clamps must be such that they permit rapid action. Even so, it it necessary to have perhaps as many as ten men on the clamping operation in order to do it in the time, although one man alone may be sufficient for the actual forming sequence.

To see the forming of a blown bubble hood intended, for example, for a Sea Fury, is entrancing. The forming tool consists simply of a front wall shaped as a complement to the front screen framing, and a smaller rear wall sloped backwards at about 45 deg. Between these walls is fitted a pair of "chines" over which the hot sheet of Perspex is draped, thereafter to be clamped by a special frame which is lowered on to the former and firmly holds the Perspex against the wall edges and along the skirts. Compressed air is then admitted to the interior of the form tool and blows the sheet to the familiar hood shape. The former-chines serve not only to support the Perspex during the clamping operation, but also control the contours to which the sheet is blown in order to give the correct fore/aft curvature and, at the same time, give ballooning to the sides. The great advantage of the blowing technique is that the surface of the Perspex is not pressed against any mould surface and, therefore, does not become marked; a matter of paramount importance when optical qualities of a high standard are required as, of course, they are for aircraft applications.

C. B. B-W.

CORRESPONDENCE

The Editor of "Flight" does not hold himself responsible for the views expressed by correspondents in these columns. The names and addresses of the writers, not necessarily for publication, must in all cases accompany letters.

AIRMET

MAY I crave the hospitality of your columns to make a few pertinent remarks on Airmet? I am a regular Airmet user and have made cross-country flights entirely on the strength of their forecasts, which have always proved extremely accurate and reliable.

The faults of Airmet are, I consider, spoiling it at the moment and I know from talking to many people there is general agreement with me. My complaints are as follows:—

(1) Why must we have the present appalling interval signal? It is not musical, and quite infuriating to listen to. Let us have the opening bars of "Auld Lang Syne" or anything rather than the present one.

(2) Some of the forecasters and announcers speak very badly and incoherently. I realize the forecasters are not meant to be announcers, but I do consider that they might be given some hints on the art of speaking on the radio, e.g., not to drop their voices at the end of a sentence.

(3) The almost continuous overmodulation, which does not aid intelligibility.

(4) Background noises of various sorts. There is always a hum like an electric motor when the modulation is on and I have heard "noises off" varying from talking and whistling to doors shutting and people walking about during the forecaster's description of the weather.

(5) When navigational warnings are read, co-ordinates of points enclosing danger areas, etc., are usually read at such a rate that it is an impossibility to take them down. This is in complete contrast to the "weather at dictation speed," where the gaps are so long it is often possible to write the sentence or phrase down about four times.

I hope the Ministry will note these few small points, because they do spoil what is otherwise a quite invaluable service.

Northampton. I. B. CHURCH.

[We entirely agree. Even B.B.C. announcers are occasionally guilty of elocutional faults, but at least they do not have to compete with the rattle of tea-cups—an Airmet accompaniment which we have more than once heard. Bad transmission, however, is the station's worst fault.—ED.]

RE-TAILING

IT would appear that "Favonius" in his "American Notebook" (*Flight*, September 29th) has a somewhat short memory when he criticizes Robert McLarren (Engineering Editor, *Aviation Week*) for stating that several prominent American aeronautical engineers consider some "mods" to the Comet's tail unit will *perhaps* be necessary as its extensive programme of testing flying goes forward.

In building the prototypes of several outstandingly successful transport aircraft, it would appear both British and American designers have suffered from the same basic set-backs in their theoretical calculations, viz., the size and general design of tail-units, and especially the right amount of stabilizer control-surfaces.

"Favonius" quotes the case of the Boeing 314 flying boat as being "a classical example" of this sort of thing. May I suggest that only after exhaustive test flying of the prototype did the original tail design and control surfaces show that they were quite inadequate, and required considerable modification?

Going back a few years, what about the prototype D.H.91 Albatross in 1937, the Boeing 307 Stratoliner in 1938, and the Douglas DC-4 Skymaster in the same year, and later, even the wartime Avro York (whose prototype first flew in 1942, I believe)? In each case, in the prototypes of these world-famous and veteran transports considerable modification was found to be necessary to their original tail designs. The very beautiful and shapely designed D.H.91 (originally designed, I believe, to an Air Ministry spec. and afterwards adapted to the requirements of Imperial Airways for their European routes) had a very small and almost frail-looking tail unit, which later had to undergo considerable modification, finishing up as the now widely used twin fins and rudders design. In the Boeing Stratoliner (five of which are still in service in the U.S.A.), a much bigger area of stabilizer surface was found to be necessary after the loss of the first prototype, a second one being built and the trouble rectified. The DC-4 prototype (the original of which first flew in 1938 and was afterwards sold to Japan) had a large triple tail unit—not unlike that of the Constellation in some ways—but Douglas engineers discarded this in favour of the conventional large single fin and rudder—that was in 1941. In the case of the Boeing boat, the position was reversed! Lastly, the first York built had an exact replica of the Lancaster's twin tail. The additional centre stabilizer was found to be very necessary after prototype testing.

Prestwick, Ayrshire. DENNIS M. POWELL.

AMBULANCE VENTILATION

IN the interesting "Farnborough" edition of *Flight* (September 15th), I note that some firms were exhibiting aircraft capable of rapid conversion to air ambulances.

May I put forward a plea for adequate ventilation to be carefully considered by the manufacturers of such machines? What may be thought sufficient for healthy passengers may be quite insufficient for those with respiratory diseases, etc., during warm weather. PATIENT.

Montana, Switzerland.

SEARCH FOR SILENCE

DESPITE the quasi-humourous yet doubtless heartfelt comments of "Hush-a-bye" (*Flight*, September 23rd), regarding the noise nuisance of low-flying aircraft, a good deal of design attention is. in fact, being devoted to this problem.

The whole matter is rendered the more difficult by the fact that aircraft inherently operate on so narrow a margin of efficiency that only minima can be afforded in making concessions. It is not at all difficult to silence a conventional piston engine, provided that the concomitant loss of power is admissible. A great deal of work has been done by Rolls-Royce on silencing for civil Merlins, and, to quote *Flight*, January 22nd, 1948, test results with a new design of tailpipe indicated that "it is by far the quietest so far known; it has at least established that exhaust noise can be reduced below that of the airscrew."

The question of airscrew noise is also bound up with efficiency. It is a matter of providing sufficient blade-area to absorb the power, whilst keeping blade tip-speed sufficiently low to steer clear of too many compressibility losses. Contraprops are one of the results of this design compromise, as are swept-back blades; ducted fans, although not in use at the moment, may yet be taken off the shelf and actively employed.

So far as gas turbines, and particularly turbojets, are concerned, so much attention has been devoted to developing the power unit as such that little has been devoted to making it quiet. This matter is, however, now receiving some attention and there is no reason to believe that, even if complete suppression of jet noise is beyong attainment, at least its magnitude may be diminished.

Southampton, Hants. VIBRATRIX.

FORTHCOMING EVENTS

Oct. 14. Colleges of Automobile and Aeronautical Engineering; Dance.
Oct. 18. Institute of Navigation: Annual General Meeting and Dinner.
Oct. 18. R.Ae.S. Section Lecture: "Flutter Problems," E. G. Broadbent, M.A., F.R.Ae.S.
Oct. 19. R.Ae.S. (Reading): "Atomic Energy," A. G. Salmon, B.Sc., A.Inst.P.
Oct. 19. R.Ae.S. (Weybridge): "Aircraft in Future Warfare," Air Marshal Sir Robert Saundby, K.B.E., C.B., M.C., D.F.C., A.F.C.
Oct. 19. R.Ae.S. (Brough): "Operating Factors Effecting Design of Civil Transports," by C. Dykes, M.A., M.Sc., M.I.Ae.S.
Oct. 25. R.Ae.S. Section Lecture; "New Methods of Stressing," J. Hadji-Argyris, A.F.R.Ae.S.
Oct. 26. Royal United Service Institution: "The Soviet Armed Forces", by Maj.-Gen. R. Hilton, D.S.O., M.C., D.F.C.
Oct. 26. Society of Instrument Technology: "Fifty Years in the Optical Industry," by F. Twyman, F.R.S.
Oct. 27. R.Ae.S. Graduates; "High-lift Devices," R. R. Duddy, A.F.R.Ae.S.
Oct. 29. Helicopter Association; "Jet Propulsion of Rotor Blades," A. Stepan, Dipl. Ing.
Oct. 31. R.Ae.S. (Derby): "Cierva Air Horse," by J. S. Shapiro, Dpl. Ing., A.F.R.Ae.S.
Nov. 2. R.Ae.S. (Luton): "Gas Turbine Development."
Nov. 3. R.Ae.S. Graduates; "Hydraulic Analogy of Compressible Flow," H. Ritter, B.Sc. (Eng.).
Nov. 8. R.Ae.S. Section Lecture: "Resonance in Aerodynamics," by R. A. Shaw, M.A., F.R.Ae.S.
Nov. 9. R.Ae.S. (Weybridge): "The Brabazon I," F. H. Pollicut, F.R.Ae.S.
Nov. 15. R.Ae.S. Graduates: "Visualization of Airflow at High Speeds," by A. D. Young, A.F.R.Ae.S.

SERVICE AVIATION

Royal Air Force and Naval Aviation News and Announcements

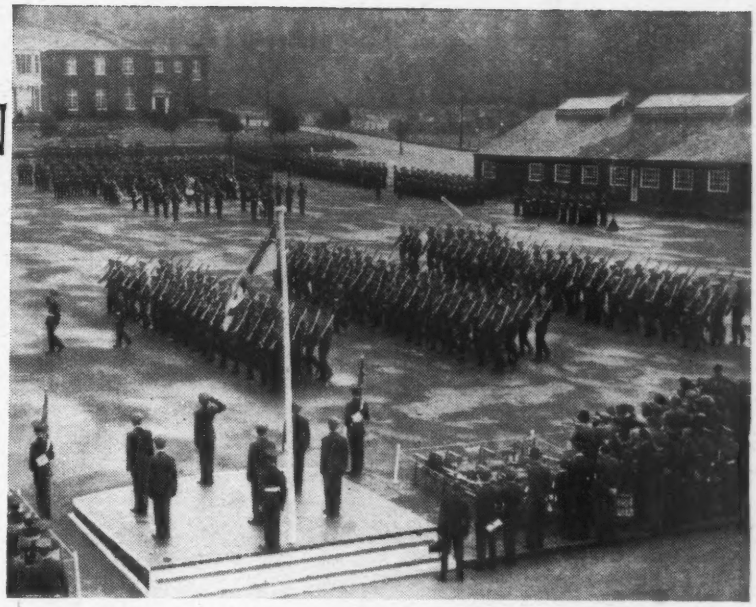
Royal Visit

HER MAJESTY THE QUEEN, who recently honoured No. 600 (City of London) Squadron, R.Aux.A.F., by becoming its Honorary Air Commodore, will visit the Squadron at Biggin Hill on Saturday, October 29th.

Bomber Command Memorials

AT a service in Lincoln Cathedral at 1500 hr on Tuesday, November 8th, the memorial books of Nos. 1 and 5 Groups, Bomber Command, containing the names of 21,000 aircrew lost on operations during the war, will be formally consigned to the Dean and Chapter of the Cathedral. New furnishings for the R.A.F. Chapel in the Cathedral, where the books will be retained, will be dedicated at the service. Air Marshal Sir Aubrey Ellwood, the A.O.C.-in-C., Bomber Command, will hand over the books, and the Bishop of Lincoln, the Rt. Rev. M. H. Marland, will preach the sermon.

Relatives of those remembered in the Rolls of Honour who wish to attend the ceremony should apply for tickets to the Sub-Dean, The Sub-Deanery, Lincoln, before October 20th next, and *not* to the Air Ministry or to Bomber Command. Arrangements have been made for relatives to see the books after the service. They will subsequently be open to inspection by the public and a leaf of each book will be turned daily. The inscription on the title pages of the books is: "In memory of those members of aircrews of No. 1 (or No. 5) Group, Royal Air Force, who, on operational missions against the enemy, flew from bases in Lincolnshire and the neighbouring counties and did not return."



GRADUATION: The impressive scene at Halton on Wednesday of last week, when the A.O.C.-in-C., Flying Training Command, Air Chief Marshal Sir Ralph A. Cochrane, took the salute of 200 graduating apprentices of the 54th Entry.

R.A.F. Appointments

THE Air Ministry announces that, with effect from October 31st, Air Marshal Sir Leslie N. Hollinghurst, K.C.B., K.B.E., D.F.C., is appointed to the Air Council as Member for Personnel, in place of Air Marshal Sir Hugh W. I. Saunders, K.B.E., C.B., M.C., D.F.C., M.M., who becomes Inspector-General of the R.A.F. Thus the appointments are an exchange of duties.

Sir Leslie Hollinghurst has been Inspector-General since September, 1948, and was formerly Air Council Member for Supply and Organisation for three years. From November, 1944, until the end of the war against Japan he was A.O.C., Base Air Forces, South East Asia, and was previously A.O.C., No. 38 Group, in which capacity he was responsible for the British airborne operations in the Normandy landings on D-Day. Born in 1895, he enlisted in the Royal Engineers as a motor-cycle despatch rider shortly after the outbreak of war in 1914. He was commissioned in the Middlesex Regiment in 1916, and transferred to the R.F.C. later that year.

Sir Hugh Saunders has been Air Member for Personnel since October, 1947, and was formerly A.O.C.-in-C., Bomber Command, from January of that year. He was Air Marshal Commanding the R.A.F. in Burma from August, 1945, until the end of 1946; previously he was Director-General of Postings at the Air Ministry, taking up this appointment in November, 1944, after having been Air Officer Commanding, No. 11 Group, Fighter Command, for two years. Air Marshal Saunders is 55 and joined the Witwatersrand Rifles in August, 1914; he was commissioned in the R.F.C. in 1917, receiving a permanent commission in the Royal Air Force two years later. He won the M.M., the M.C., and the D.F.C. in France in the 1914-18 war, during which he destroyed at least 10 enemy aircraft.

TOUR OF OCCUPATION; Photographed at Gutersloh, starting-point of his recent six-day, 2,000-mile tour of B.A.F.O., is Marshal of the R.A.F. the Viscount Trenchard; with him are (left to right) A. Cdre. L. F. Sinclair, A.O.C. 2 Group, G/C. W. B. Murray, the Station Commander, and Air Marshal T. M. Williams, the A.O.C.-in-C.

Indian "All-through" Training

TO improve existing flying instruction standards and increase the number of pilots trained, the Royal Indian Air Force has introduced the "all-through"

SERVICE AVIATION . . .

training system, as employed by the R.A.F. The three colleges at Coimbature, Jodhpur and Ambala have been combined into two academies at the two latter stations. *Ab initio* pilots posted there will undergo 39-week courses of instruction, receiving at least 100 hours' basic flying training.

Pre-service Privilege

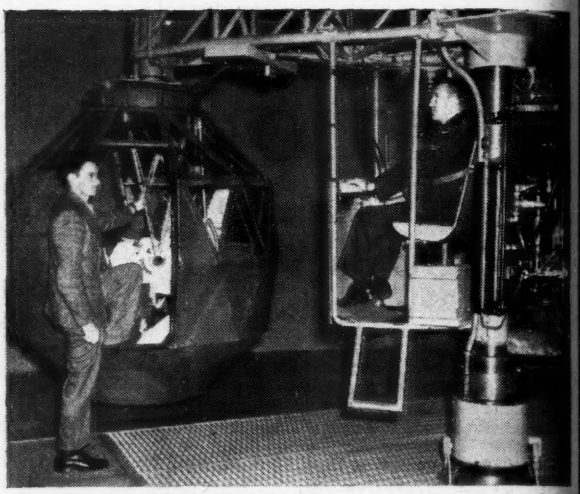
FLIGHT Sergeant Cecil Crook, one of two A.T.C. cadets accompanying Air Chief Marshal Sir John Slessor, the C.A.S.-designate, on his two-month tour of overseas R.A.F. units, received good news early in the tour. A message, radioed to Sir John's York from the Air Ministry, stated that the cadet had been accepted for training, as a General Duties Branch officer, at the R.A.F. College, Cranwell.

The two cadets, who are acting as air quartermasters during the tour, were selected from the seven reserve groups as being the most deserving. Cadet F/S. Crook is a member of 130 (Bournemouth) Squadron, and his companion is Cadet Cpl. F. C. Reid, of 825 (Bangor) Squadron.

September Operations in Malaya

DURING September, R.A.F. forces in the Federated Malay States experienced their busiest month since the "emergency" began. Dakotas of No. 48 Squadron have borne the brunt of this increase in operations and have recorded some remarkable figures in dropping leaflets and supplies. In support of the Government surrender offer, Dakotas visited 163 selected areas in the Federation and dropped over a million leaflets in Chinese, Tamil and Malayan. Supply to security forces by air again increased, and a record total of 189,140 lb was dropped to units operating in Selangor, Pahang, Kelantan, Perak and Negri Sembilan; 66 supply-dropping sorties were flown and 145 separate drops were made, involving the use of some 1,300 parapacks.

In addition, Dakotas have flown 25 communication sorties, in which 357 members of the security forces and 10,000 lb of freight have been conveyed to various destinations throughout Malaya. Beaufighters have made 13 air strikes, totalling 49 sorties, in support of ground forces. Photographic reconnaissance, air escorts, air/sea and visual reconnaissance as well as demonstration flights, account for a further 56 sorties in a month of concentrated air activity.



WHIRLIGIG: A Royal Canadian Air Force flight cadet prepares to take his place in the accelerator, which is used by the R.C.A.F. Aircrew Classification Centre to discover the physical reactions of potential aircrew members to centrifugal forces at high speed. Its "victim," incidentally, is a member of the class "F" reserve, which provides pilots for R.C.A.F. regular or auxiliary squadrons on completion of initial flying training.

Benevolence at Work

DURING the first half of this year the R.A.F. Benevolent Fund spent £367,455 on all forms of help to serving and former members of the R.A.F. and W.R.A.F., and their dependants. This total was distributed between 15,743 cases, and was an increase of 31 per cent on the sum spent during the corresponding period of 1948 — in itself a record year.

B.U.A.S. Ceremony

NEXT Wednesday, October 19th, Mr. Sidney Vernon, pro-chancellor of Birmingham University, will open a new headquarters building for the Birmingham University Air Squadron. He will be accompanied by A. Cdre. G. H. Vasse, the A.O.C., 63 Group, Sir Raymond Priestley, the vice-chancellor, and deans of the faculties.

The new building, which is prefabricated and has a club-room, lecture-room and offices, is situated at the University Grounds, Edgbaston, Birmingham. Opening of the H.Q. coincides with the new-term annual recruiting drive of the Squadron, which is commanded by S/L. G. Birt, D.S.O., D.F.C.

Reunion

FORMER members of No. 287 Squadron are notified by F/L. Ron Grose that the next reunion will be held on Friday, October 21st, at 1800 hr, at the Chandos Inn, Trafalgar Square.

The Carrying of Canes

UNDER a new Air Ministry order, station commanders are permitted to carry 24-in swagger canes, covered in black leather, at all times. Officers who command station flying, technical or administrative wings, and officer instructors at recruit or technical training stations may carry them only while on parade or duty within the station bounds. The question of allowing all officers to carry canes will be considered later.

Desert Air Force History

MANY of the 700 officers and men of the Desert Air Force who in 1945 subscribed for copies of a history of the force have since changed their addresses. Those who have not yet received their copies of the book, which was compiled by F/O. Roderic Owen, are asked to notify the R.A.F. Benevolent Fund, 1, Sloane Street, London, S.W.1, quoting also their service number, rank and unit at the time of subscription.

AUXILIARY GUNNERS: Members of No. 600 (City of London) Light Anti-Aircraft Squadron, R.Aux.A.F. Regiment, during their recent annual training camp at Watchet, Somerset. In the front row are: (left to right) Sgt. Atkins, F/S. Fisher, F/O. O'Driscoll, F/L. Holl, F/L. Cowan, C.O., S/L. Collings, Instructor/Gunnery, F/Lt. Murphy, Adjutant, F/L. Rowland, F/O. Dowling, F/O. Giles, Sgt. Ainsworth. The unit's town headquarters are at Finsbury Barracks, London, and its week-end training takes place at Stanmore Park, Middlesex.